FEVER HOSPITALS. By T. W. Aldwinckle [*F.*].

Read at the General Meeting, Monday, 25th February 1895; and, with the illustrations, registered at Stationers' Hall as the property of the Royal Institute.

I WISH to preface this Paper with two preliminary remarks. In the first place, very much of what is herein written as to the requirements of Fever Hospitals will, necessarily, apply to hospitals of all kinds, being general principles of sanitation; and in the second place, as we are at the present time only upon the threshold of the vast and intricate subject of provision for infectious diseases, this Paper has been written rather in the spirit of inquiry than of dogmatism—not pretending to lay down hard-and-fast rules, but rather as offering suggestions, based to some extent upon practical experience, for the consideration of those who may be interested in the subject.

It is difficult to overestimate the importance of the subject which we are to consider this evening. Infectious disease may be regarded as an invading and powerful enemy, ever ready to enter the dwelling or the city, and to cause widespread ruin and destruction. Past history tells us only too forcibly how powerful and destructive this enemy has been, in times now happily gone by, when its inroads were unchecked by the fortifications of medical science and legislative provisions; and it is well within the province of Architecture to lend her powerful aid to the researches and efforts of Medicine in this defensive war against a common foe. The architect who would join in this humane crusade must, in order to be useful and successful, make himself intimately acquainted with the minute detail of the inner working of a Fever Hospital, and he could not do better than always bear in mind the following pregnant words from Sir Douglas Galton's book on *Hospital Construction*:—

> Cleanliness and fresh air do not so much give life as they are life itself to the patient. Cleanliness—clean air, clean water, clean surroundings—and a fresh atmosphere are the true safeguards against infection, segregation by ample floor and cubic space, ample ramparts of fresh atmosphere, rather than segregation by walls and divisions. You cannot lock in or lock out the infectious poison. You can air it, diffuse it, and clean it away.

The general awakening of the public mind to the absolute importance of the isolation of persons suffering from infectious diseases is quite a recent one, as evidenced by the fact that thirty years ago there was in this country a complete absence of any organised system of infectious hospitals, and that London at that time possessed only two—viz. the London Fever Hospital, in Liverpool Road, Islington, and the Small-pox Hospital at Highgate, both institutions being entirely supported by voluntary subscriptions. Some of the general hospitals received fever patients under conditions of very imperfect isolation; failing which, infectious cases were sent to the workhouse, with results which can be easily imagined. As a natural consequence, the majority of patients suffering from fevers were treated in their own homes, and the general community lived on peacefully, utterly oblivious of the fact that infectious

diseases were rampant in its midst, and only quickened into a slight sense of interest by occasional epidemics. The one great principle, that an infectious case treated in its own home generally became a centre of infection, had only been recognised by the few.

The Sanitary Act of 1866 first gave powers to the local authorities to build, or otherwise arrange for, permanent or temporary hospitals for infectious diseases, and these powers have been considerably enlarged by the Public Health Act 1875 and the Isolation Hospitals Act 1893. This latter Act authorises County Councils to arrange for the erection (through a hospital committee) of isolation hospitals, with the powers of the Public Health Act 1875 as to the purchase of land. The cost of the land and that of building, furnishing, and maintenance of the hospital are to be defrayed by a local rate. This rate, however, is not to include "patients' expenses," which are described as the cost incurred in conveying, removing, and feeding the patients, and providing medicines, disinfection, and all other things required for patients individually. These expenses are to be paid as follows:—(*a*) In the case of a pauper, by the guardians of the union from which he is sent; (*b*) in the case of a non-pauper, by the patient, and is to be a debt recoverable at law.

So far as the provinces are concerned, these enabling Acts have not been adopted to the extent that could be desired: but of recent years there has grown up an increased recognition of the value of, and indeed the necessity for, the isolation of infectious diseases: and at the present time isolation hospitals are being built throughout the country, the designing of which has been very materially assisted (especially in the case of the smaller hospitals) by the excellent plans and instructions issued by the Local Government Board.

On the other hand, the Metropolis has been separately dealt with. In the year 1867 an Act was passed (commonly called Gathorne Hardy's Act), under which the Metropolitan Asylums Board was created as an authority for providing for the treatment of (*a*) persons suffering from infectious diseases; (*b*) imbeciles. We may dismiss this latter class (*b*) from our consideration. This was a distinctly Poor Law creation, and those who were treated under its provisions became, by law, paupers. But the importance of this measure, and the great benefits which it conferred upon London, can scarcely be over-estimated. For the first time in its history, the Metropolis was placed under the care of a central and representative authority, having power to provide for the reception and treatment of fevers as an organised system. The newly constructed Board speedily got to work, and two infectious hospitals, one at Homerton and the other at Stockwell, were opened in the early part of 1871, a temporary hospital at Hampstead having been opened in January 1870. Subsequently the following hospitals were erected by the Board:—

Western Hospital	366 beds,	opened	March	1877
South-Eastern Hospital	462 „	„	„	„
Northern Hospital (for convalescing patients)	680 „	„	Sept.	1887
Gore Farm Convalescent Hospital,* Darenth, near Dartford	1,192 „	„	Oct.	1890
North-Eastern Hospital†	400 „	„	„	1892
Fountain Hospital†	406 „	„	„	1893

In the year 1887 London was visited by a severe epidemic of scarlet fever, and in order to meet the greatly increased requirements, the Metropolitan Asylums Board were compelled to erect temporary wooden buildings, wherever space could be found, on their then existing hospital sites, and by this means they were able to provide accommodation for quadruple the number of fever patients that they had been called upon to treat in their hospitals at any one

* Although nominally a small-pox hospital, the Gore Farm Hospital has hitherto been used for either small-pox or fever convalescent patients. Since its opening, it has been twice used as a fever hospital, once as a small-pox hospital, and once for both diseases simultaneously.

† Temporary hospitals.

time during the previous ten years. Another epidemic spread over London in the year 1892, continuing throughout the following year. The then existing accommodation in the Board's hospitals was, however, still quite inadequate to meet the demands, and in 1892 a temporary hospital for 400 beds was erected at Tottenham, under the direction of Messrs. Harston, architects; and in 1893 another temporary hospital for the same number of beds was erected at Tooting, under the direction of the writer of this Paper. Both hospitals were erected as complete and fully equipped institutions in a few weeks, without contracts, the architects being entrusted by the Board with a free hand and with full power to incur the necessary expenditure.

Even these additional provisions did not fully meet the permanent and increasing needs of the Metropolis, and the Asylums Board are providing three more hospitals, each for about 500 beds, at Hither Green, Tooting, and Shooter's Hill, the latter being now in course of erection, while the contracts for the two former will shortly be let.

There is one very marked difference between London and the provinces as regards the administration of infectious hospitals. The Public Health Act of 1875 and the Isolation Hospitals Act 1893 give power to the local authorities of the provinces to make a charge, in respect of individual expenses, to non-pauper patients; but neither the Metropolitan Asylums Board nor the several Boards of Guardians have now any such power, sub-sections 2 and 3 of section 80 of the Public Health (London) Act 1891 throwing the whole of the expenses incurred in the maintenance of infectious cases upon the Metropolitan Common Poor Fund. On the other hand, it is no longer necessary to obtain a Poor Law relieving officer's order to qualify for admission into the Board's hospitals, the certificate of a qualified medical man being sufficient; and by the same Act the pauper character of the relief offered is also expressly removed, and the Board's hospitals are freely made use of by all classes. This would appear to be the right course, as, in the general interests of the community, it is preferable in most cases that a person suffering from fever should be isolated in a hospital, rather than remain a centre of infection in his own home, as he might elect to do if he thought that he would have to pay for his treatment while in hospital.

One great cause of the increased use of Fever Hospitals has, undoubtedly, been the passing of the Infectious Diseases (Notification) Act 1889. This Act provides—

(*a*) That the head of the family or the nearest relative of the patient resident in the building must give immediate notice (in case of infectious disease) to the Medical Officer of Health.

(*b*) That the medical practitioner attending on the patient, on finding a case of infectious disease, must notify to the Medical Officer of Health for the district the name of the patient, the situation of the house, and the infectious disease from which the patient is suffering.

One other point in connection with the recent history of isolation hospitals is important and instructive. In the case of the earlier hospitals, it was the practice to provide for both fever and small-pox patients upon the same site in two adjoining hospitals with separate administrative buildings, the hospitals at Homerton and Stockwell being illustrations of this arrangement. But in the year 1881 the growing feeling that small-pox hospitals were sources of danger to their surroundings induced the Local Government Board to instruct a Commissioner to make an investigation, taking the Western Hospital as the subject of special inquiry. The result of his investigations led him to the conclusion that small-pox had increased in the immediate vicinity of the hospital; that the proportion of houses attacked varied with the distance from the hospital; and that, "on comparison of recent epidemics, an almost constant "ratio is observed between the amount of the hospital operations and the degree of excess of "small-pox in the neighbourhood." About the same time, certain residents at Hampstead successfully brought an action against the Board in respect of the small-pox hospital there, the Court of Queen's Bench deciding that the hospital was a legal nuisance. The managers

subsequently obtained an order for a new trial (on appeal), but the action was eventually settled out of Court.

One result of all this was that the Asylums Board purchased three ships—the *Atlas* and the *Endymion*, opened in the autumn of 1881, and the *Castalia*, opened in the summer of 1884—and converted them into a floating small-pox hospital, moored in the Thames at Long Reach, erecting a laundry and administrative buildings upon eight acres of land adjoining. This hospital provides for 300 beds. The old small-pox wards at the several hospitals were then thrown open for the reception of fever patients, and at the present time the Board have no land hospitals for small-pox in London.

Passing now from the historical to the practical side of our subject, we will first of all glance at the main principles which should govern the planning of a fever hospital, premising that these general principles apply in most cases equally to hospitals of all sizes.

The amount of infectious hospital provisions to be made in proportion to the populations is an important subject, and I cannot do better than quote from a Paper read by Dr. Thorne Thorne, the Medical Officer of the Local Government Board, at the Seventh International Congress of Hygiene and Demography held in London, August 1891. He says:—

> Speaking generally, it has been estimated that the provision of one bed per thousand inhabitants is sufficient for the permanent requirements of a sanitary district. But such requirements will necessarily vary with the character of the population. Thus, in a locality where the population is well-to-do, and most houses of a size and construction that offer reasonable facilities for the isolation of single attacks of the current infectious fevers, the amount of hospital accommodation needed for public health purposes will be less than in a manufacturing or colliery district, where infectious disease cannot be treated in the houses in which it breaks out without very great risk, if not certainty, of spreading.

The site should be, if possible, just outside the town or village for which it is intended. The question of transport of the patient is not so serious a difficulty as to outweigh the great advantages to be derived from the hospital having open fields rather than houses as its surroundings. Good ambulance arrangements will go far to overcome all difficulties as to transport. The land should be capable of good drainage, and there should be the means for a good and ample water-supply. The land should stand at a fairly high level, and a gentle fall towards the south is a distinct advantage. If there are any trees on the site when purchased, those on the north and east boundaries, at least, should be left standing if possible.

There should be two entrances to the hospital, one the "infected entrance" and one the "non-infected entrance," both controlled from the same porter's lodge. A wide roadway should run round the whole of the site, as a neutral zone to separate the hospital from the surrounding property. The axes of the ward pavilion should be as nearly as possible north-east and south-west, in order to provide for the maximum quantity of sunlight and the minimum of shade. This is of the utmost importance, and should be carefully borne in mind in the selection of a site. The ward pavilions should not, where practicable, be of more than one storey in height. This may necessitate the purchase of a larger site than otherwise, but the compensating advantages are many. I do not suppose that any experienced hospital architect would, by choice, place fever wards one above the other, necessitating, amongst other evils, much traffic up and down staircases, to say nothing of the obvious objections from a sanitary point of view; so that considerations of land area can be the only reason. It may be pointed out in this connection that the distance between the one-storeyed pavilions can safely be less than that between those of the two storeys, so that the expansion of the plan need not be so great as would at first appear. In the former case, 50 feet will be sufficient; whereas in the latter case, the width should not be less than twice the height of the pavilions, and would thus be not less than 65 feet.

The whole of the several buildings of an infectious hospital should be completely isolated,

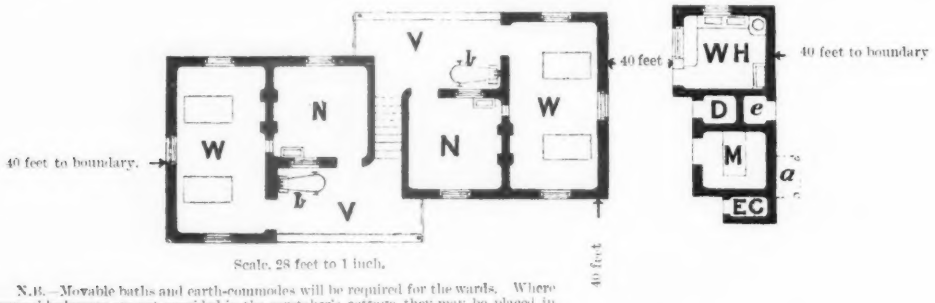
and stand perfectly free, without communicating corridors or covered way of any kind. This is not suggested as an experiment, but as the result of personal observation in the case of several excellent hospitals, such as the Eppendorf Hospital, Hamburg; the Moabit Infectious Hospital, Berlin; the Frederikshain Hospital, Berlin; the Urban Hospital, Berlin; the Belvidere Hospital, Glasgow; the Grafton Street Infectious Hospital, Liverpool. Others can be named, of which, however, I cannot speak from personal observation, such as the Epidemic Hospital, Copenhagen; the Ladywell Sanatorium, Salford; the Heathcote Infectious Hospital, Leamington, &c. It will doubtless be admitted that in an infectious hospital complete and absolute isolation of each ward pavilion, at least, is most desirable, and there should be good reasons adduced for in any way impairing such isolation by the introduction of communicating corridors, even with open sides. It is stated by some hospital authorities that these covered ways are necessary in order to protect the staff from the weather; but, apart from the fact that they are wholly inefficient for such a purpose, the authorities at the hospitals which I have mentioned as being without corridors or covered ways have all assured me that the staff experience no ill effects or inconvenience whatever from their absence. The complete isolation of the buildings is recognised and prepared for; the nurses and others dress accordingly, and the arrangements for conveying hot food from the kitchen to the wards are so well considered and complete that the food is, in all probability, hotter when it reaches the wards than where covered ways exist. There should be a clear space of at least three feet between the underside of the ground floor of all wards and the adjoining yard level, and the space thus left underneath the floor should be paved with tar paving, or some equally impervious material, laid in such a manner that the rain-water shall naturally drain off the same.

The ward pavilions for diphtheria or enteric fever should be separated at as great a distance as possible from those for scarlet fever. The isolation wards should be well separated from the remainder of the hospital. The official department and the kitchen and stores should be centrally situated, and the stores should be as near as possible to the "non-"infected entrance." The staff quarters should be quite free from, and unsurrounded by, the ward pavilions or other infected buildings. The three classes of the subordinate staff in a large hospital—viz. nurses, female servants, and male servants—should have separate and distinct homes, each home being under the *resident control* of the principal officer responsible for its discipline. The laundry should be as free as possible from the hospital proper and from the staff quarters. No infected building should be nearer than 40 feet to the boundary, nor to any other building, infected or otherwise, in the hospital.

In the acquisition of a site for a fever hospital, the question arises as to the number of beds per acre that can safely be provided. In the plan B [p. 271], issued by the Local Government Board, the hospital of 8 beds is placed upon one acre of land. For larger hospitals I do not think that the maximum should exceed 20 beds per acre. At the Belvidere Hospital, Glasgow, there are 17 beds to the acre; at the Grafton Street Infectious Hospital, Liverpool, 34 beds; at the Moabit Infectious Hospital, Berlin, 40 beds. The older hospitals of the London Asylums Board show a somewhat higher proportion, the Eastern Hospital having 40 beds per acre; the Western Hospital, 36 beds; the South-Western Hospital, 47 beds; the South-Eastern, 42 beds per acre; while their hospitals recently built or now projected bear the following proportion:—North-Eastern, 22 beds; Fountain Temporary Hospital, 40 beds; Brook Hospital, 16 beds; Park Hospital, 28 beds, and the Fountain Permanent Hospital, 19 beds per acre. The temptation is very great to raise the number of beds per acre where the land is expensive; but it should be borne in mind that land is at once the cheapest and most permanent part of the expenditure upon a hospital.

This question leads to another, and a very important one, viz. as to the maximum number of beds for which an infectious hospital should be built. The requirements of large

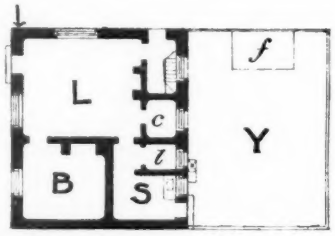
towns necessitate the provision of a large number of beds; but it is an open question, most suitable for discussion, whether the aggregation of large numbers of acute infectious cases upon one site is desirable, and whether it would not be a preferable course to arrange hospitals for a smaller number of beds, and to increase the *number* of such hospitals in order to provide for the total number of beds required. As an illustration, if the population require a provision for 400 beds, I would suggest the erection of two hospitals for 200 beds each, rather than one for 400 beds; and where the required provision is for 750 beds, three hospitals of 250 beds each might be preferable to two of 375 beds. Indeed, a maximum of 300 beds suggests itself as desirable. It is usually less difficult to obtain sites for small hospitals than



N.B.—Movable baths and earth-commodes will be required for the wards. Where nurses' bedrooms are not provided in the caretaker's cottage, they may be placed in an upper storey of the Ward Block.

for large ones, and the hospitals being distributed would, in the case of large towns, render them more easy of access.

For our purposes we can divide fever hospitals into three classes—viz. (*a*) Small isolation hospitals, suitable for groups of villages or small towns; (*b*) hospitals not exceeding 100 beds; (*c*) hospitals exceeding 100 beds.



W, Ward. N, Nurse. V, Verandah. WH, Wash-house. D, Disinfector. M, Mortuary. EC, Earth-closet. L, Living-room. B, Bedroom. S, Scullery. Y, Yard. *a*, Ashes. *c*, Crockery. *e*, Dry earth. *l*, Larder. *f*, Fuel. *b*, Bath on wheels.

FIG. 1 A.—TYPICAL PLANS FROM THE LOCAL GOVERNMENT BOARD MEMORANDUM: PLAN A.

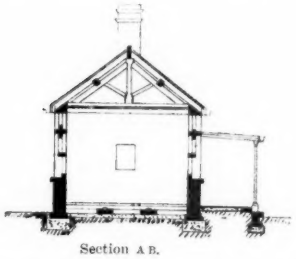
The first class of hospital is well illustrated by plans taken from the Memorandum issued by the Local Government Board in 1888, and reissued in 1892 and again in the present year, entitled "On the Provision "of Isolation Hospital Accommodation by Local Authorities." The following extracts from this Memorandum are of great practical value, and fully describe the plans:—

English communities nowadays recognise the advantage of isolation hospitals as a means of preventing the spread of infectious diseases from persons who cannot be properly isolated in their own homes. But too often the provision of such hospitals is put off until some infectious disease is immediately threatening, or has actually invaded, a district. It cannot be too clearly understood that an isolation hospital, to fulfil its proper purpose of sanitary defence, ought to be in readiness beforehand. During the progress of an epidemic it is of little avail to set about hospital construction. The mischief of allowing infection to spread from first cases will already have been done, and this mischief cannot be repaired.

Large villages, and groups of adjacent villages, will commonly require the same sort of provision as towns. Where good roads and proper arrangements for the conveyance of the sick have been provided, the best arrangement for village populations is by a small building accessible from several villages; otherwise the requisite accommodation for, say, four cases of infectious diseases in a village may at times be got in a fairly isolated and otherwise suitable four-room or six-room cottage which has been acquired by

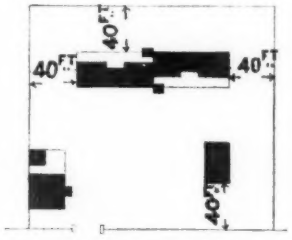
the Authority, or by arrangement made beforehand with some trustworthy cottage-holders, not having children, that they should receive and nurse, on occasion, patients requiring such accommodation.

In towns, hospital accommodation for infectious diseases is wanted more constantly, as well as in larger amount, than in villages; and in towns there is greater probability that room will be wanted at

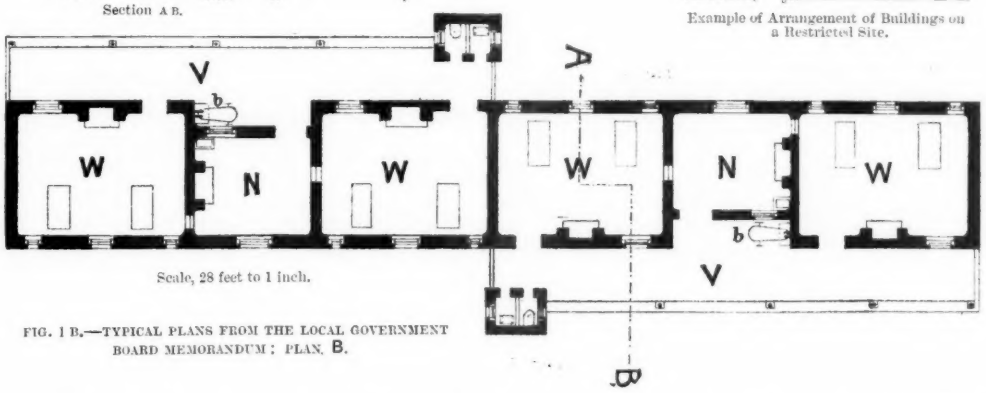


Section A B.

V, Verandah. W, Ward. N, Nurse. b, Bath.



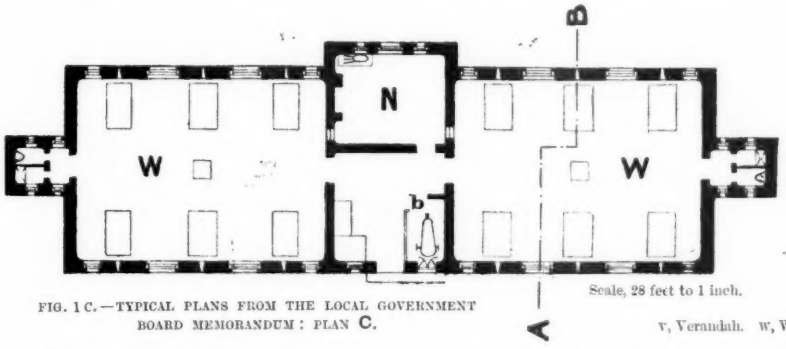
Example of Arrangement of Buildings on a Restricted Site.



Scale, 28 feet to 1 inch.

FIG. 1 B.—TYPICAL PLANS FROM THE LOCAL GOVERNMENT BOARD MEMORANDUM: PLAN B.

the same time for two or more infectious diseases which have to be treated separately. The permanent provision to be made in a town should consist of not less than four rooms, in two separate pairs, each pair to receive the sufferers from one infectious disease, men and women of course separately. The number of cases for which permanent provision should be made must depend upon



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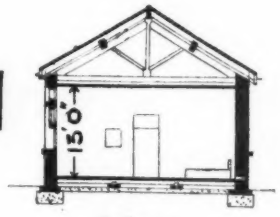


Section A B.

FIG. 1 C.—TYPICAL PLANS FROM THE LOCAL GOVERNMENT BOARD MEMORANDUM: PLAN C.

V, Verandah. W, Ward. N, Nurse. b, Bath.

various considerations, among which the size and growth of the town, the housing and habits of its population, and the traffic of the town with other places are the most important. . . .

For a town the hospital provision ought to consist of wards in one or more permanent buildings, with space enough for the erection of other wards, temporary or permanent. Considerations of intimate economy make it wise to have permanent buildings sufficient for somewhat more than the

average necessities of the place, so that recourse to temporary extensions may less often be necessary. In any case it is well to make the administrative offices somewhat in excess of the wants of the permanent wards; because thus, at little additional first cost, they will be ready to serve, when occasion comes, for the wants of temporary extensions.

Plans illustrating the sanitary requirements of small hospitals for infectious diseases are arranged on three sheets accompanying the present Memorandum. Plan A [p. 270], on the first sheet, is that of a little building to hold two patients of each sex. On the second sheet, a plan and a section (B) [p. 271] of a rather larger hospital building are shown, providing for eight persons, with separation of sex, and also of one infectious disease from another. A convenient disposition of buildings upon site is also indicated on the same sheet. The third sheet shows a plan and section (C) [p. 271] of a small pavilion, adapted to receive six male and six female patients suffering under one kind of infectious disease. It will be found that in all the plans proper standards of space are observed—viz. not less than 2,000 cubic feet of air-space, than 141 square feet of floor-space, and 12 linear feet of wall-space to each bed—and that means are provided for the adequate ventilation and warming of wards, and for securing them from closet emanations and the like. In plan A [p. 270], earth-closets, in other plans water-closets, are indicated as the means of excrement disposal. The latter are to be regarded as preferable where efficient sewers are available. Places for washing and disinfection, and for a mortuary, are indicated. It will be observed that an interval of 40 feet is everywhere interposed between every building used for the reception of infected persons or things, and the boundary of the hospital site. This boundary should have a close fence of not less than 6 feet 6 inches in height, and the 40 feet of interval should not afterwards be encroached upon by any temporary building or other extension of the hospital.

The second class of hospital is well illustrated by the following:—The Heathcote Infectious Hospital, Leamington; the Willesden Isolation Hospital; and the Grafton Street Infectious Hospital, Liverpool.

The Heathcote Infectious Hospital, Leamington [fig. 2, p. 273].—This isolation hospital provides at present for 22 beds upon an area of 2 acres 2 roods, and comprises four buildings, each completely isolated, and there are no covered ways. The administrative block, which is the only two-storey building on the site, is placed near the entrance, and contains, on the ground floor, a sitting-room for the matron and nurses, a room for the medical officers, kitchen, scullery, larder, and the usual offices; and on the first floor, bedrooms and bathroom for the matron, nurses, and servants. Another block comprises the laundry and disinfecting arrangements. The hospital proper consists of two buildings—one called the Ward Block, and the other the Isolation Block. The Ward Block contains two wards, each for six beds, intended for patients all of one disease, but as male and female wards. A nurses' duty-room and the bathroom are placed between the wards, the duty-room overlooking both wards. Each bed has a linear wall-space of 12 feet, a floor-space of 156 feet, and a cubic space of 2,028 feet. The Isolation Block is divided by a cross-wall in the centre into two equal portions, both portions being upon the same plan, but facing reverse ways. Each portion comprises a duty-room, one ward for three beds, and two wards for one bed each, together with a space for a movable bath, a w.c., and a slop-sink, the intercommunication throughout being by means of a verandah. In these wards the allowance per bed is 216 feet floor-space, and 2,592 feet cubic space.

The walls of the wards are lined to a height of 5 feet with tinted glazed bricks, above which they are plastered and distempered. The floors are laid with yellow deal in 3 inch widths, ploughed and tongued. The vertical angles of the walls, the horizontal angles at the junction of floors and walls, and of walls and ceilings, are all rounded, so are also all the angles of door panels and of the windows, and in the finishing of the doors and windows rounded fillets only are used, no recessed mouldings being used anywhere.

The windows, which form the principal means of ventilation, are divided into two parts by a transome, which is fixed about 18 inches down from the head of the frame. Above the

transome is a "hopper light," hung at the bottom to fall inwards, and provided with glazed cheeks at the sides to prevent down-draughts. Below the transome are double-hung sashes. In addition to the windows, openings are made at the floor-level behind each bed, and provided with Ellison's radiator ventilators; and there is in each ward an extraction flue carried up alongside the smoke flue, from which it is separated by iron plates. The inlet to the flue is at the ceiling-level, with a Bunsen burner, to produce an upward current when the fire is first lighted.

The Willesden Isolation Hospital [fig. 3, p. 275].—This isolation hospital provides at present for 42 beds upon about seven acres of land, or 6 beds to the acre. The porter's office at

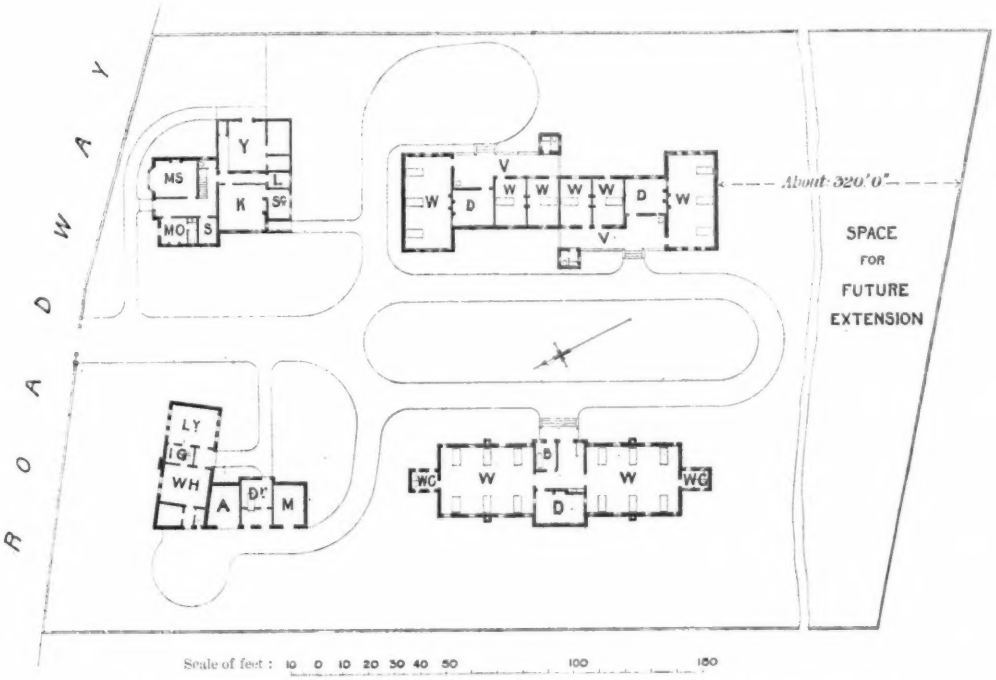


FIG. 2.—THE HEATHCOTE INFECTIOUS HOSPITAL, LEAMINGTON [p. 272]. (Mr. Keith D. Young, Architect)

W, Ward. D, Duty-room. B, Bath-room. WC, W.c.'s and Slop-sinks. V, Verandah. MS, Matron's Sitting-room. MO, Medical Officer's Sitting-room. K, Kitchen. SC, Scullery. L, Larder. S, Store. Y, Yard. DI, Disinfector. M, Mortuary. A, Ambulance. WH, Wash-house. LY, Laundry. IC, Ironing closet.

the entrance contains, in addition to his living-rooms, an inquiry office, and waiting-room for friends of patients. The administrative block, which has wisely been designed to meet the requirements of future extension, comprises the usual accommodation for the medical officer, the matron, and a staff of about twenty nurses and servants, together with the kitchen and stores. There are three ward pavilions, each of the same plan. Each pavilion contains two wards for 8 beds, the nurses' duty-room in the centre of the block overlooking both wards. The bath-room is also in the centre facing the nurses' room. To each ward are a w.c. and a slop-sink in a turret at the end of the ward. The walls of the wards are lined to a height of 3 feet with salt-glazed bricks, above which is Keene's cement highly polished. The floors are kept up 4 feet above the general level of the ground, and are of fireproof construction; and a terrace, 2 feet 6 inches high and 6 feet wide, is formed round the entire pavilion. The linear

wall-space per bed is 12 feet, the floor-space 156 feet, and the cubic space 2,028 feet. The wards are warmed by double-faced open ventilating fireplaces with descending flues, so as not to obstruct the view down the ward.

The isolation pavilion is divided in the centre by a cross-wall, separating the block into two distinct divisions, one division facing east and the other west. Each division contains two wards, one for two beds and one for three beds, with a nurses' room between the wards and overlooking both. All these rooms are entered from a verandah, in which there is a space provided for a movable bath. Each division has, also, a w.c. and a slop-sink. The internal arrangements and finishings are similar to those in the ward pavilions, except that the floor-space per bed is 216 feet, and the cubic space per bed 2,800 feet. To the rear of the ward pavilions is a raised asphalte terrace upon which temporary buildings or tents can be quickly erected should occasion arise. At one corner of the site are the laundry block, the boiler-house, a steam disinfector, a mortuary and post-mortem room, and an ambulance-house. The whole of the buildings at this hospital are completely isolated, without communicating corridors of any kind.

Grafton Street Hospital, Liverpool [fig. 4, p. 277].—This hospital provides for 69 beds upon a little over two acres. The whole of the buildings are completely isolated, there being no connecting corridors or covered ways of any kind. The administrative block contains, on the ground floor, medical officer's sitting-room and bedroom, matron's sitting-room and bedroom, committee-room, officers' dining-room, nurses' day-room, servants' hall, dispensary, kitchen, and stores; and upon the first floor bedrooms for the staff. There are two main ward pavilions, each of two storeys, the ground floor for males and the upper floor for females, the staircase being well separated from the ground-floor ward, and approached externally. Each ward holds eight beds, and the two wards are overlooked from a centrally placed nurses' duty-room. The ward on one side is used for acute cases, and the other for convalescing patients. There is per bed 12 feet linear wall-space, and 156 feet floor-space. The isolation block contains two wards of two beds each, and one ward for one bed, with two nurses' duty-rooms, with baths, w.c., and slop-sinks, also in duplicate, thus admitting of two separate diseases, at least, being dealt with at the same time. There are also separate laundries for the staff and for patients, a complete disinfecting establishment, a mortuary and post-mortem room, and stables and coach-house for ambulance purposes. This is a complete Fever Hospital in miniature, and is well worth a visit.

The larger class of hospitals will be well illustrated by the following:—The Belvidere Infectious Hospital, Glasgow; the Moabit Infectious Hospital, Berlin; the London Fever Hospital; the Ladywell Sanatorium, Salford; the Epidemic Hospital, Copenhagen; the Infectious Hospital, Budapest; the Northern Convalescent Hospital, Winchmore Hill; the Park Hospital, Hither Green; the Fountain Permanent Hospital, Tooting; and the Brook Hospital, Shooter's Hill.

While I have referred to the Memorandum of the Local Government Board as governing the designs for smaller infectious hospitals, I think that this is the proper stage at which to refer to another document of equal value, which deals with hospitals of larger size. When, some two years ago, the Metropolitan Asylums Board were proposing to build additional hospitals, a specially appointed committee of that Board made a most exhaustive inquiry, extending over several months, as to the necessary requirements of a large Fever Hospital, visiting the principal institutions of similar character, and consulting with the most competent experts on the subject. The result was the issuing of a series of instructions to architects who were to compete for two of the new hospitals, and such instructions form, so

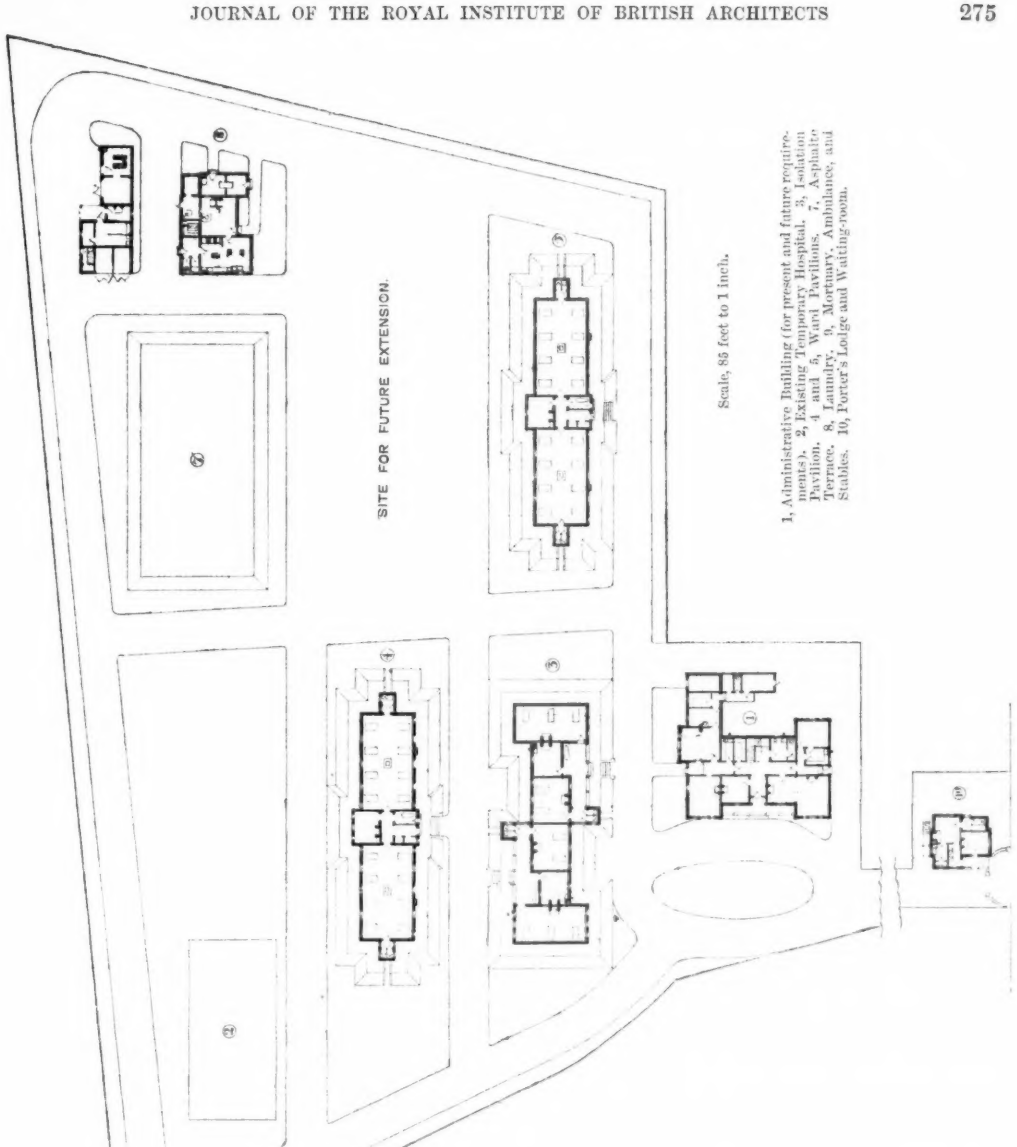


FIG. 3.—THE WILLESDEN ISOLATION HOSPITAL [p. 273].

(Messrs. Edmeston and Gabriel, Architects.)

far as I am able to judge, the most complete text-book in existence on Fever Hospital requirements.

Belvidere Hospital, Glasgow [fig. 5, p. 279].—Upon this site of 32 acres, admirably situated, are two hospitals, one for fever, containing 390 beds, and one for small-pox, with 150

beds, each hospital with separate and distinct administrations, except that there is a central system of boilers, from which steam is conveyed to both hospitals for the purposes of heating, cooking, washing, &c. I will limit my description to the Fever Hospital. This hospital has two excellent features—the whole of the ward pavilions are of one storey, and there is a complete absence of connecting corridors of any kind, the latter feature being perfectly satisfactory to the authorities of the hospital. Another good feature is that the ward floors are in all cases not less than 4 feet above the general yard level, leaving a good air-space underneath the floor. Again, the staff quarters are well removed from the hospital proper. There are 13 ward pavilions, all of the same plan. Each pavilion consists of two separate and distinct sections, each section comprising an acute ward for 11 beds, a convalescent ward for 4 beds, the cubic space per bed in the former ward being 2.136 feet, and in the latter 2,500 feet. The wards are narrow, being only 22 feet wide, and the linear wall-space per bed does not average more than 9 feet. The high cubic space is obtained through having an open roof, the extreme height internally being 23 feet 9 inches to the apex, an arrangement not desirable for hospital wards. For so large a hospital the wards are small and numerous, thus increasing the cost of nursing. The nurses' room projects slightly into the ward with a bay window, but is not fitted up as a ward scullery. The wards are warmed by open fireplaces, and by low-pressure hot-water pipes running round the walls. The windows are double-glazed, with an air-space of three-quarters of an inch between the two panes of glass. Fresh air is admitted by direct openings beneath the windows, so arranged (under control) that the air passes over the heating pipes. There are ventilating dormers on opposite sides of the roof, Boyle's air-pump ventilators on the ridge, and ventilating shafts rising alongside the chimneys. There are separate laundries for the staff and for the patients, and a third laundry for washing the patients' own clothes. The stores and kitchen are centrally situated, the former being conveniently placed in relation to the entrance to the hospital.

The Moabit Hospital, Berlin [fig. 6, p. 281].—This hospital contains 800 beds upon 20 acres, or 40 beds to the acre. It was built originally as a purely infectious hospital, but other cases are now also received. The buildings, originally of a somewhat temporary character, are by degrees being remodelled and rendered more permanent, and a nurses' home has just been erected. The administrative buildings are placed to the front, and well apart from the ward pavilions. There are 29 ward pavilions, all of one storey only, nearly all of which have their axes east and west. The whole of the hospital buildings are completely isolated, with no connecting corridors of any kind. Each ward pavilion contains one large ward (the majority for 28 beds), duty-room, bathroom, w.c.'s, sink-room, and nurses' sleeping-room. The position of the w.c.'s and sink-room relatively to the ward would not satisfy English ideas of sanitation. The space for bed is as follows:—Wall-space, 6 feet 6 inches; floor-space, 75 feet; cubic space, 1,000 feet. In a few of the more recently constructed pavilions these spaces are slightly increased. The walls are bricknogged, and lined internally with boarding, the roofs are open, and the floors are laid with terrazzo. The warming is entirely by means of steam pipes running along the walls, there being two rows of piping on the north side of the ward, and one row on the south side. The ventilation is by means of a lantern ventilator in the ridge and by the windows, which consist of casements with a hopper fanlight over; but I was informed that the windows are seldom opened in winter. The temperature of the ward when I visited the hospital in December last was 68° Fahr. The majority of the ward pavilions are only 30 feet from the hospital boundary, some of them being still nearer. The steam for all purposes is generated in six large double-flued boilers, all of which have to be used in the winter. There is a large and well-appointed disinfecting house, with three steam disinfectors, and the baths are provided for the officers of this

department. There are no receiving wards at this hospital, the patients being taken direct to the ordinary wards.

London Fever Hospital [fig. 7, p. 283].—This hospital, which contains 150 beds upon an area of 3½ acres, or 43 beds to the acre, was opened in the year 1849, and until 1871 was the

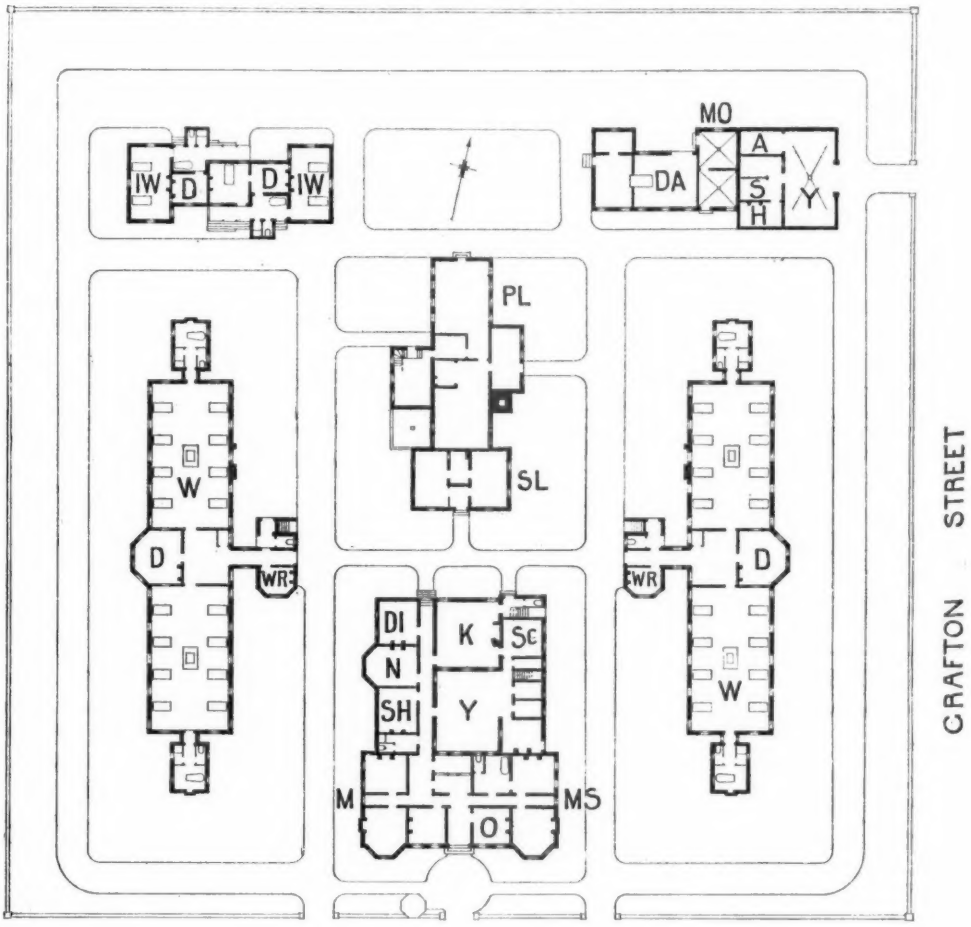


FIG. 4.—INFECTIOUS HOSPITAL, GRAFTON STREET, LIVERPOOL [p. 274]. (Mr. J. W. Simpson and Mr. E. J. Milner Allen, Architects.)

W, Ward. D, Duty-room. IW, Isolation Ward. PL, Patients' Laundry. SL, Staff Laundry. K, Kitchen. Sc, Scullery. M, Matron's Quarters. MS, Medical Officer's Quarters. DA, Disinfector. MO, Mortuary. S, Stables. H, Harness. A, Ambulance. Y, Yard. WR, Waiting-room. N, Nurses' Day-room. SH, Servants' Hall. DI, Dispensary. O, Office.

only Fever Hospital in London. It is supported by voluntary contributions. Until the year 1871 the hospital received almost exclusively the poorer classes; but the work of the Metropolitan Asylums Board after that date rendered this unnecessary, and at the present time the beds are occupied, to a great extent, if not exclusively, by paying patients. The wards for enteric fever were built in 1864. The general plan of this hospital, with the main buildings forming

an almost closed quadrangle, and with the principal wards for four rows of beds, will serve well to illustrate the progress made in hospital planning since this building was designed.

The Ladywell Sanatorium, Salford [fig. 8, p. 285].—The Ladywell Sanatorium at Salford contains 184 beds, and stands upon about $7\frac{1}{3}$ acres of land, giving 25 beds per acre. Space is left for a future pavilion to contain 48 beds, and when that is built there will be 32 beds per acre. The whole of the buildings are completely isolated, without connecting corridors of any kind. The administrative block stands quite free from the ward pavilions, and near the main entrance. It contains on the ground floor the official rooms, such as committee room, doctor's office, lady superintendent's office, sitting-rooms for the doctor, lady superintendent, and dispenser, and also the nurses' mess- and sitting-rooms. Bedrooms for the doctor and dispenser are placed on the first floor, with a separate staircase. The remainder of the upper floors of this block is devoted to nurses' bedrooms, servants' bedrooms, &c. Slightly to the rear stands the kitchen block, which (conveniently placed in regard to the ward pavilions) contains dispensary, kitchen, stores, servants' hall, &c.

There are at present three two-storey ward pavilions, the staircase leading to the first floor being well disconnected from the ground-floor wards. Each floor contains an acute ward for 6 beds, and a convalescent ward for 18 beds, a nurses' duty-room in the centre overlooking both wards, the bathroom facing the duty-room. The space per bed is—floor space, 169 feet; cubic space, 2,197 feet. The water-closets and slop-sink are placed opposite the staircase, and separated from the main pavilion by a well-ventilated corridor 12 feet long. The wards are warmed by open ventilating fire-places, and by external air warmed by passing over steam radiators placed in the window recesses. The exhaust ventilation is by means of extraction shafts, in which steam coils are placed to induce a rapid current of air. A striking feature in connection with these wards is that the side windows extend, without break, from floor to ceiling, so that in summer the patients can enjoy the advantage of living practically in the open air, but protected from the direct rays of the sun.

There are also two pavilions, each of two storeys, containing isolation wards, for the isolation of doubtful cases, and also to be used by paying patients. The stairs leading to the upper floors of these blocks are so placed that the nurses in charge of the upper wards would have no communication with those connected with the lower wards. In each pavilion there are four wards of two beds each, and four wards of three beds, together with four duty-rooms and four w.c.'s, thus admitting of the treatment of four different diseases at the same time. A verandah on the west side of the block forms a covered means of intercommunication between the several rooms, and the inconvenience caused by the ward doors opening directly into the open air (the usual difficulty in isolation wards of this type) is in this case overcome by reducing the size of the duty-rooms, and thus forming lobbies, from which the wards are entered. This hospital contains (in addition to the usual duplicated laundries for officers and patients) a sanitary department for the disinfection, not only of patients' clothes, but also of carpets, draperies, and the like, from all infected houses in the borough.

The Epidemic Hospital, Copenhagen [fig. 9, p. 287].—The Epidemic Hospital at Copenhagen contains 168 beds upon an area of 22 acres, or nearly 8 beds to the acre. The administrative block is placed free of the ward pavilions. There are eight ward pavilions, all of one storey. Of these, six are divided by a cross-wall into two perfectly distinct and separate portions, and contain wards of 12 beds, 6 beds, and 1 bed. The other two pavilions contain only wards for 1 bed each. One of these pavilions is reserved for ordinary isolation purposes, and the other for paying patients. None of the water-closets are placed in projecting turrets, as is the case with us, but lead direct from the ward corridors. There are also the administrative block, containing the official rooms, receiving-rooms, visiting-rooms, doctor's rooms;

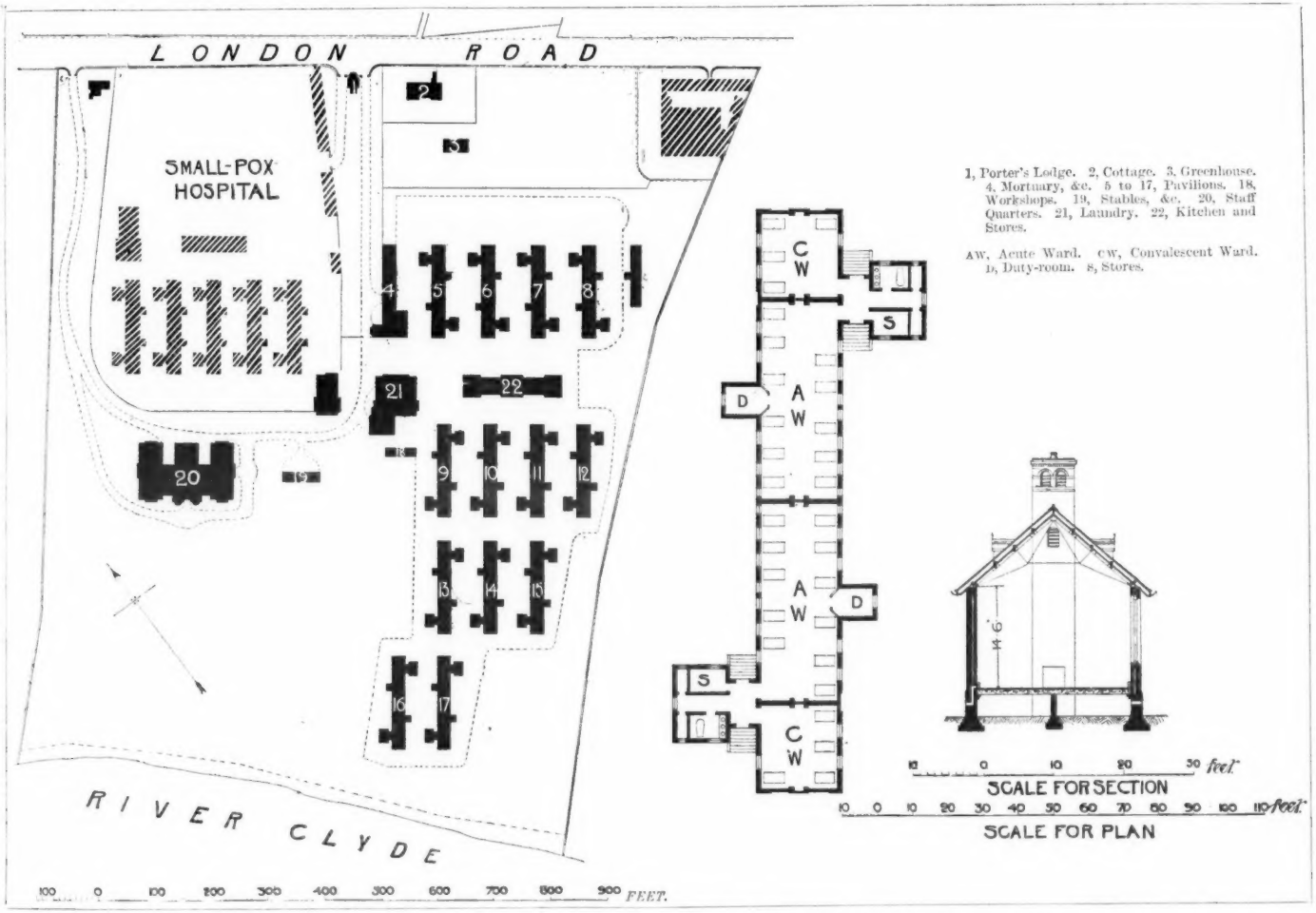


FIG. 5.—THE CITY OF GLASGOW FEVER HOSPITAL, BELVIDERE [p. 275]. (Mr. John Carrick, the Master of Works.)

also the kitchen block, laundry block, stables block, and mortuary block. The whole of the hospital buildings are entirely isolated, without connecting corridors or covered ways of any kind. The main wards are 26 feet wide, but the linear wall-space per bed is only 6 ft. 8 in., and the floor-space 86 feet.

The Infectious Hospital, Budapest [fig. 10, p. 289].—The new Infectious Hospital at Budapest contains 200 beds upon an area of 13¼ acres, or 15 beds to the acre. There are 8 one-storeyed pavilions, all of the same design, connected together by means of a covered way having open sides. Each pavilion contains one main ward for 16 beds, 2 wards for 4 beds each, and one single-bed ward. In the main ward the linear wall-space per bed is 6 ft. 9 in., the floor-space 88 ft. 6 in., and the cubic space 1,460 feet. A striking feature of this hospital is that the ward floors are raised nearly 9 feet above the general yard level, the space underneath forming a sub-storey, the floor of which is level with the ground. In this sub-storey are placed the channels for part of the heating apparatus. The wards are warmed by two systems: (*a*) by external air warmed and filtered at the intake, and arranged to enter the ward through covered pedestals placed in the centre of the ward, the intake being at a point about 16 feet above the ground level, at the top of a turret placed about 16 feet from the pavilion; (*b*) by means of external air entering through the side walls, and being warmed by passing over steam radiators placed in the window recesses. There are no receiving wards, the patient being examined at the main entrance, and passing thence to the wards.

The Northern Convalescent Hospital, Winchmore Hill [fig. 11, p. 291].—The Northern Hospital at Winchmore Hill is the convalescent hospital of the Metropolitan Asylums Board. It contains 480 beds upon an area of 36½ acres, or about 13 beds to the acre. The administrative block stands free from the ward pavilions, and contains the official rooms, and the kitchen, stores, and laundry. There is also a residence for the medical superintendent. There are 16 separate ward pavilions, all of the same plan (except in two instances), 14 containing 32 beds each, and two containing 16 beds each. The ground floor of each pavilion contains a day-room, a dining-room, kitchen, charge-nurse's sitting-room, stores, &c. The upper floor contains two wards, each for 16 beds, charge-nurse's bedroom, linen-store and baths, lavatories and w.c.'s. The wards are 26 feet wide, and the linear wall-space per bed is 6 feet, the floor-space 78 feet, and the cubic space 1,014 feet. The buildings of this hospital are all completely isolated, without connecting corridors or covered ways of any kind. Each pavilion is so arranged as to form, to some extent, a small hospital in itself. Two new pavilions are now in course of erection.

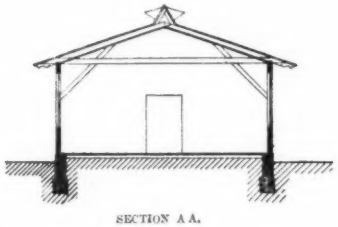
The Park Hospital, Hither Green, Lewisham.—The site of this hospital is about 19¼ acres in extent, of undulating ground, on which is a good deal of fine timber, of which as much will be retained as is possible. About one half of the periphery is bounded by main roads. The main entrance is opposite the end of the road from London. To the right are the porter's lodge and the residence of the medical superintendent. In front is the block of offices, committee-room, chaplain's room, &c. To the left is the block of discharging- and waiting-rooms. Beyond are the mortuary and the education block. The road then leads to the central administrative block, containing the residences for servants, the steward's stores and yard, and the kitchen buildings. This central block is flanked on the one side by the steward's house, and on the other by that of the assistant medical officers. Behind the central block rises the water and clock tower. To the east of this block are four pavilions for diphtheria, containing in all 120 beds; to the west are eight pavilions for scarlet fever, containing 368 beds; and to the south of these are six isolation pavilions, containing 60 beds—a total of 548. This will be the largest hospital for infectious diseases in the metropolitan area.

To the south-west, at the highest part of the estate, is the nurses' home, consisting of three buildings, connected by covered ways, one being reserved for night nurses, the others for day nurses, and for the mess-, sitting-, and writing-rooms, sculleries, &c. The sleeping accommo-

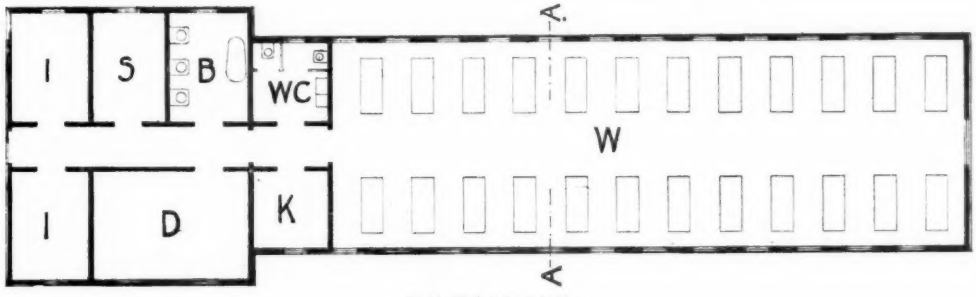
BLOCK PLAN.

1 to 29, Ward Pavilions. 30, Isolation Block. 31, Administrative. 32, Kitchen. 33, Laundry. 34, Porter. 35, Fire Brigade. 36, Bathing-house. 37, Workshops. 38, Boilers. 39, Disinfector. 40, Stable for Animals for Experiments. 41, Mortuary. 42, Operating. 43, Nurses' Home.

W, Ward. I, Isolation Ward. D, Nurses' Room. K, Kitchen. B, Bath. S, Stores. WC, W. C. and Lavatory.



SECTION A A.



Scale, 20 feet to 1 inch.

PLAN OF PAVILIONS.

FIG. 6.—THE MOABIT HOSPITAL, BERLIN [p. 276]. (The Municipal Architect.)

dation is for 192 nurses in all. To the south-east are the laundries for patients and staff, the artificers' workshops, the engine- and boiler-houses. All the pavilions are kept about 100 feet distant from the boundary, and a road is carried entirely round them. The various portions of the hospital are connected by covered corridors. The lighting will be by electricity generated on the premises; the heating will be by low-pressure hot water heated by steam. There

are telephones and electric fire-alarms throughout, and hydrants for extinguishing fires in every building. These are kept charged, and a steam fire-engine is also provided. The floors and partitions throughout the hospital are of fire-resisting construction, and there is no internal communication between any two storeys of the various pavilions. A separate airing-court is provided for each pavilion. There are also airing-balconies on each floor of every pavilion. The buildings are to be of brick, with terra-cotta and stone dressings, the roofs of slates. The architect is Mr. Edwin T. Hall, who has kindly lent me his plans for the evening.

Fountain Permanent Hospital, Tooting Graveney.—This hospital is one of the three new establishments now being erected by the Metropolitan Asylums Board, the plans for which have been prepared by Mr. A. Hessell Tiltman, who has lent me a reduced plan showing the buildings as they will be completed, and supplied me with the following particulars relating to them. The site is about 27 acres in extent, and gives accommodation for 520 patients, divided in the following manner:—8 two-storeyed pavilions for scarlet fever, accommodating 352 patients; 4 two-storeyed pavilions for diphtheria and enteric fever, accommodating 112 patients; 4 one-storeyed isolation blocks, accommodating 36 patients; 2 one-storeyed isolation blocks, accommodating 20 patients. Generally speaking, the ward blocks and all accessory buildings of an infectious character occupy one side of the site longitudinally, the administrative block being located somewhat centrally, and close up to the entrance gates. The homes for the nurses and domestic servants, together with their mess-rooms, are placed on the opposite side of the administrative central line to that of the ward pavilions.

The chief motives in the arrangement of the large ward pavilions have been the ranging them *en échelon*, with the longitudinal axes of their large wards pointing in every case due north and south; the isolation of the individual block of each class of wards; and the due separation of the blocks for the different classes of infectious diseases. The pavilions for diphtheria and enteric fever are those placed nearest to the doctors' offices and quarters; whilst those for scarlet fever are kept as far from the former as possible, the isolation block being placed parallel to and between these two sets of pavilions. For the convenience of the medical and nursing staffs, a wide roadway, leading directly from the entrance gates, has been formed, cutting centrally and transversely through the site up to the covered way leading to the scarlet-fever wards.

The scarlet-fever pavilions are two storeys in height, and all the eight blocks are precisely similar in plan and arrangement. There are on each floor one main ward for 20 beds, one two-bedded ward, ward scullery, linen-room, pantry, and all necessary sinks and bathrooms, w.c.'s, &c. The superficial area, wall-space, and cubical capacity per bed are those now ordinarily adopted by the Board.

The diphtheria and enteric-fever pavilions are similar in plan and arrangement to those for scarlet fever, with the exceptions only that the large wards hold 12 beds each, instead of 20, and that the cubical capacity, floor-area, and wall-space are increased to the extent of 25 per cent.

The isolation pavilions are one-storeyed buildings only, and are six in number. Four of these accommodate 9 beds each (two four-bedded wards and one one-bedded ward). The other two blocks each contain one six-bedded ward and two two-bedded wards. These all have the regulation cubical capacity and superficial area. The ground-floor line of all ward blocks is raised some 4 feet 6 inches from the ground line, so as to secure good circulation of air under the whole of the buildings.

The steward's house has been so placed as to overlook the main entrance and the entrance to the store-yard; whilst, for the purpose of exercising some supervision over the male staff,

the dormitories and mess-room of the latter have been attached directly to his house. It may be noted that all mess-room blocks are within a very easy distance of the kitchen.

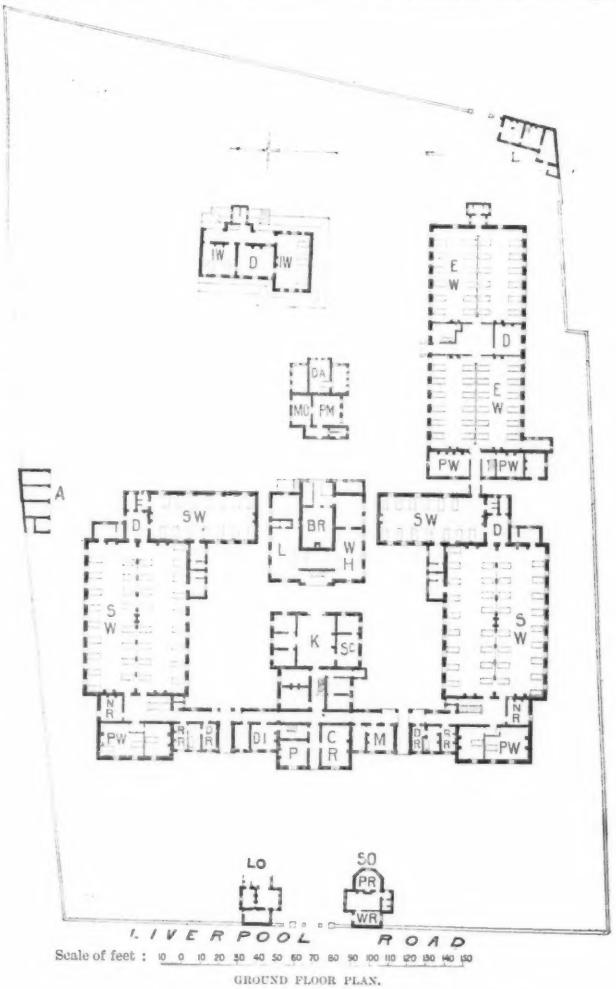
The homes for the nurses and female domestics have been arranged so that their inmates, when off duty, may be as far from the hospital wards as possible. These blocks are arranged around three open courts respectively, each for charge-nurses, assistant charge-nurses, and the female servants. The separation of this accommodation into seven separate blocks, necessitated partly by the exigencies of the site, has some advantages in point of health and supervision, together with that of a greater freedom from the danger of fire.

The accommodation for nurses' dressing block has been provided in a somewhat new and extended form. The chief motive of the arrangement is the retention of the boxes, with the outer garments, &c., of the nurses and women servants, entirely away from their respective dormitories, and the better provision for their change of dress, &c., on entering and leaving the hospital. The box-room is on the ground floor of the block, and the dressing-rooms on the first floor, divided into departments for the three classes of users.

There are two reception-rooms, of much the usual arrangement and position.

The discharge blocks are close to the main entrance; and closely adjoining is the friends' general waiting-room block.

The education and mortuary buildings are connected, and closely adjoin the entrance gates, so that hearses may enter and leave the establishment free from the observation of the patients.



GROUND FLOOR PLAN.

FIG. 7.—THE LONDON FEVER HOSPITAL, LIVERPOOL ROAD, N. [p. 277].
(Mr. Charles Fowler, Architect, 1848. Mr. Keith D. Young, present Architect.)

SW, Scarlet Fever Wards. EW, Enteric Wards. PW, Private Wards. IW, Isolation Wards. D, Duty-rooms. RR, Receiving-room. DR, Dressing-room. NR, Nurses' Room. K, Kitchen. SC, Scullery. M, Matron. P, Physician. DI, Dispensary. WH, Wash-house. L, Laundry. BR, Boiler-room. MO, Mortuary. PM, Post-mortem Room. DA, Disinfecting Apparatus. SO, Secretary's Office. PR, Private Office. WR, Waiting-room. LO, Lodge. A, Ambulance. CR, Committee-room.

The administrative block comprises the whole accommodation of the offices, medical officers' quarters, committee-rooms, dispensary, needle-room, kitchen, and general stores,

together with the domestics' mess-rooms, &c. All are concentrated into buildings to a great extent only one storey in height, and so arranged as to facilitate the work of the several divisions of them.

The laundry and boiler-house block has the usual accommodation, and connected with it is a tower for the storage of 30,000 gallons of water.

Beyond the accommodation mentioned is a house for the medical superintendent, cottage and office for the porter at the gates, workshops, and storage for coal.

The buildings are intended to be warmed chiefly by hot water, low pressure, and the lighting will be by electricity.

The Brook Hospital, Shooter's Hill [fig. 12, p. 293].—This is one of the three large Fever Hospitals projected by the Metropolitan Asylums Board, and is now in course of erection. The number of beds will, at present, be 488, upon a site of 30 acres, or 16 beds to the acre. This site is one which fulfils nearly all the requirements of an ideal hospital site. It stands at an elevation of over 200 feet above the sea level, and facing northwards towards Shooter's Hill Road, the land falls rapidly towards the south, so that the buildings are grouped on terraces facing the south, and shielded from the north and east winds. In the front portion of the site are placed the several administrative buildings, such as the official block, the kitchen and stores, the matron's department, the medical superintendent's residence, and three separate homes, respectively for the nurses, the female servants, and the male servants. The main portion of the hospital proper, or the infected buildings, stands to the rear of, and well separated from, the administrative buildings, and comprises 8 two-storeyed pavilions for scarlet fever, 4 similar but shorter pavilions for diphtheria and enteric fever, 6 one-storeyed pavilions for isolation wards, and 2 receiving wards. There are two entrances from Shooter's Hill Road—viz. the "infected entrance" and the "non-infected entrance," both controlled from the same porter's lodge. The "infected entrance" leads to the receiving wards, ward pavilions, and laundry, and the "non-infected entrance" to the official block, store-yard, and staff quarters.

The nurses' home consists of three separate blocks, one being reserved for night nurses. The mess-rooms and general sitting-rooms face the south, and have open roofs. Each nurse has a separate bedroom, 12 feet by 8 feet, with a fireplace. This home also contains the matron's residence. The blocks for female and male servants respectively are arranged upon the same principle, except that cubicles are substituted for separate bedrooms. The housekeeper resides in the block for female servants, and the steward's residence adjoins that of the male servants, and also overlooks both the store-yard and the "non-infected entrance."

There are 8 two-storeyed ward pavilions for scarlet fever, all of the same type, their axes being north-east and south-west, while the average height of the ground floor is 6 feet above the yard level. The staircase communicating with the upper floor is quite cut off from the lower ward. Each main ward contains 20 beds, and each bed has a linear wall-space of 12 feet, a floor-space of 156 feet, and a cubic space of 2,028 feet. There is also on each floor a separation ward for 2 beds, with its own w.c. The duty-room or ward scullery is so placed that it overlooks both the main and the separation wards. The wards will be warmed partly by open ventilating fireplaces and partly by fresh external air introduced through openings in the walls underneath the windows, and warmed by passing over copper radiators (low-pressure water apparatus), enclosed in galvanized iron cases with open tops. There will also be hit-and-miss gratings in the external walls at the floor level at the back of each bed, and exhaust ventilation (in addition to the open fireplaces) by means of glazed brick vertical shafts terminating well above the roofs, in which an upward current is caused by means of copper steam coils. The wards for diphtheria and enteric fever will be of similar character, but for

12 beds each, and each bed will have a linear wall-space of 15 feet, a floor area of 195 feet, and a cubic space of 2,535 feet. The hospital will also comprise separate laundries for patients and for the staff, boiler- and engine-house, discharge wards, disinfector house, work-

FIG. 8.—THE LADYWELL SANATORIUM, SALFORD [p. 278]. (Messrs. Maxwell & Tuke, and E. & F. Hewitt, joint Architects.)

AW, Acute Ward. CW, Convalescent Ward. IW, Isolation Ward. D, Duty-room. V, Verandah. S, Slop-sink. IY, Infected Yard. NY, Non-infected Yard. ST, Stables. O, Office. K, Kitchen. M, Men's Quarters. A, Ambulance. B, Boilers. PW, Patients' Wash-house. PL, Patients' Laundry. OW, Officers' Wash-house. OL, Officers' Laundry. SW, Sanitary Wash-house. SL, Sanitary Laundry. FR, Mourners' Room. DA, Disinfector. CS, Patients' Clothes Store. CB, Carpet-beating. F, Fuel. MOR, Mortuary. DW, Discharge Ward. C, Committee-room. MR, Mess-room. SO, Lady Superintendent's Office. SS, Sisters' Room. NS, Nurses' Sitting-room. DO, Doctor's Office. MS, Lady Superintendent's Sitting-room. DS, Doctor's Sitting-room. GS, General Store. SH, Servants' Hall. SC, Scullery. DI, Dispensary.

shops, and mortuary. The buildings will be lighted throughout with the electric light. There will be a complete system of telephonic and electric-bell intercommunication. The whole of the floors throughout will be of fireproof construction, and it is proposed to use terrazzo as a

floor surface for all the wards, but this proposal is still under consideration. The whole of the main buildings will be faced externally with red Leicestershire bricks.

Having given illustrations of the various types of existing Fever Hospitals, I propose that we should now consider in some detail the requirements of the infectious hospital of the immediate future, more particularly in reference to the two larger classes of hospital, leaving the very small hospitals, as we may safely do, to be governed by the already described Memorandum of the Local Government Board; and for this purpose I think that the most convenient course, and the one most likely to convey to our minds the working of such an institution, will be to follow the patient from the time of his or her arrival at the hospital until the period of discharge or burial.

Entrances.—Upon this principle we will commence at the entrance gate. Now, there should be two entrances to an infectious hospital, each controlled by the same porter's lodge, which should, in fact, stand between them. One, to be called the "infected entrance," leads to the hospital proper; and the other, to be called the "non-infected entrance," leads to the official department, stores, and staff quarters. This arrangement, while perfectly convenient in actual working, is protective to the outside public, as it enables outsiders having business with the hospital—as, for example, the delivery of stores—to transact their business without coming into contact with the infected parts of the hospital. It is important that this entrance should be as near as possible to the administrative department and staff quarters. On the other hand, the infected entrance should be as near as possible to the receiving wards, in order that the passage or transit of ambulances upon the hospital premises may be as limited as possible.

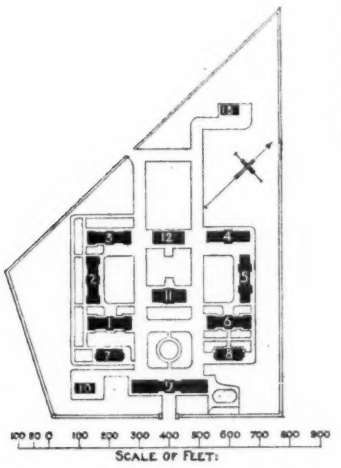
Porter's Lodge.—The porter's lodge should contain an office of good size and well lighted, opening on to both entrances, with a glass verandah on both sides. This verandah should lead, on the non-infected side, to a waiting-room, where outsiders can remain until their business has been ascertained and dealt with. The lodge should also contain a living-room, scullery, two bedrooms, pantry, coal-store, and w.c.

Receiving Wards.—There should be two receiving wards, one for scarlet fever and one for diphtheria and enteric fever. These two wards should not adjoin, but should be as near as possible to the wards of their respective diseases. Each receiving block should contain a good-sized and well-lighted receiving and examination room, with a bathroom adjoining (the doorways to these rooms being wide), together with a room for the ambulance nurses, to which should be attached in each case a warmed store for blankets and gowns. There should also be a waiting-room for friends of patients, where they put on a wrapper and cap before visiting the wards, as also a lavatory where they can wash before leaving the hospital. There should also be a small room properly fitted up for bacteriological examination in connection with the reception of patients. In this connection I may mention that, at the Belvidere Hospital, Glasgow, there is a very interesting provision in the nature of an inquiry room for patients' friends. This room is placed near the entrance, and quite unconnected with any infected buildings. There is a raised platform about 4 feet high round two sides, divided from the remainder of the room by a glazed screen, having casement windows with numbers painted on them corresponding with the number of each ward in the hospital. Cards of admission are issued to the friends for stated hours (different hours for the various diseases). The friend attends at the stipulated hour, the nurse is sent for from the ward, and from the raised platform and window, and without any contact with the visitor, can answer questions relative to the patient.

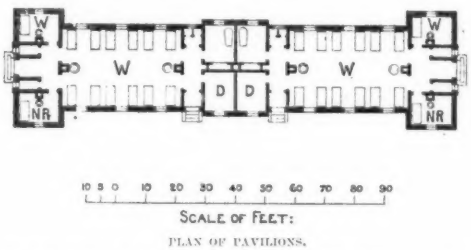
In many hospitals, particularly on the Continent, receiving wards are not provided, the

patient being *seen* by the doctor at the entrance (the word "examination" scarcely applies), and the patient is then taken direct to the ward. The necessity for a careful examination of the patient in a properly appointed receiving ward is, however, fully recognised in this country, if only as a safeguard against errors of diagnosis on the part of the certifying practitioner; and it is, moreover, most desirable, in the case of many of the poorer classes, that their clothes, for obvious reasons, should be removed before they enter the hospital wards. The patient then, having been bathed, is taken to the ward, and his clothes are disinfected, then washed, and afterwards placed in the patient's own clothes stores, which should adjoin the discharge-rooms.

Ward Pavilion.—The patient having reached the ward, we will now describe the typical ward pavilion. There will be, generally, two main groups of ward pavilions in an average-sized Fever Hospital, viz. one group for scarlet fever and another group for diphtheria and enteric fever. The proportions will vary. For instance, diphtheria is more prevalent in London than in the provinces, and a larger number of beds proportionately have therefore to be provided. But there will be no variation in the plan of the ward pavilion for either disease, except that, as will be seen later on, a larger cubic space per bed will be allotted to diphtheria and enteric fever.



BLOCK PLAN.



PLAN OF PAVILIONS.

1 to 6, Ward Pavilions. 7, Observation Pavilion. 8, Officials' Quarters. 9, Administrative. 10, Stables. 11, Kitchen. 12, Laundry. 13, Mortuary.

W, Ward. D, Duty-room. NR, Nurses' Room.

FIG. 9.—THE EPIDEMIC HOSPITAL, COPENHAGEN [p. 278]. (From Burdett's *Hospitals and Asylums of the World.*)

The first important question to be decided in connection with the ward pavilion is whether there should be one main ward to include convalescing cases as well as acute cases, or whether there should be two separate wards for the two classes. Where there is a separate convalescent hospital, as in London, the question does not arise. But these rarely exist, and in the great majority of infectious hospitals the patient must be discharged as cured and free from infection from the hospital in which he has been treated. Of the hospitals, the plans of which you have seen this evening, three have convalescent wards, viz. the Grafton Street Hospital, Liverpool; the Belvidere Hospital, Glasgow; and the Ladywell Sanatorium, Salford; but the remainder have not. It is undoubtedly an advantage for the convalescing patient to be removed from the disturbing surroundings of an acute ward as soon as possible, although in all properly ventilated wards the air ought to be as pure in an acute as in a convalescent ward; but it must be borne in mind that the multiplication of wards increases the number of ward adjuncts, such as lavatories and water-closets, and increases the duties of nursing. It is also difficult when the ward pavilion is so divided to find a suitable position for a properly lighted and ventilated separation ward. Again, if we assume—as we may naturally do—that the cubic space in a convalescent ward can be safely reduced

from the standard of 2,000 feet, it is evident that an acute ward, containing none but acute cases, must necessarily have a larger cubic space than the standard referred to.

On the whole, therefore, there would appear to be good reason for adhering to the single ward type, and in our description of the typical ward pavilion we will proceed upon that assumption, although the main principles of ward construction will apply in either case.

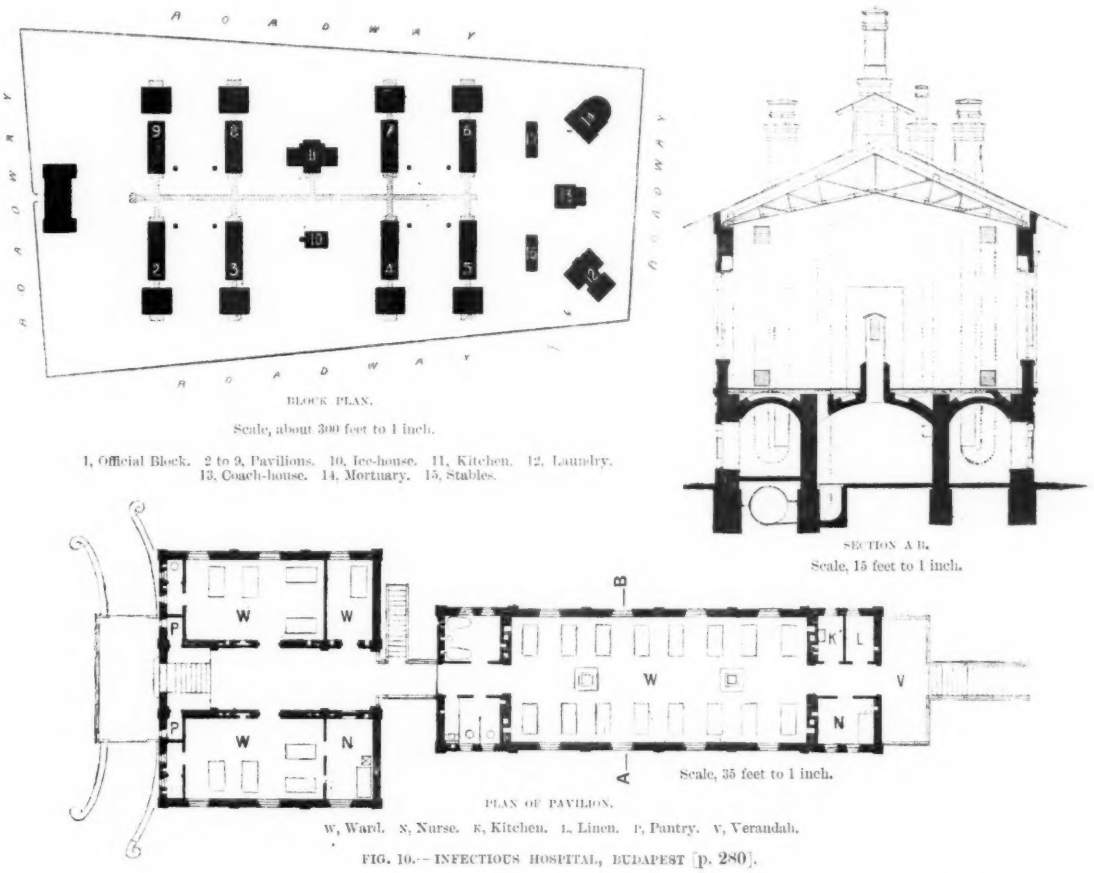
The ward pavilion, then, whether of one or two storeys, would comprise the following upon each floor :—The main ward and the separation ward. The ward adjuncts, viz. the duty-room ; the water-closets and sinks ; the bathroom and lavatory ; the linen-store ; the larder ; the nurses' w.c., lavatory, and robing-room. If there be two storeys, the staircase leading to the upper floor should be completely isolated from the lower ward and its appurtenances, and there should always be a second or escape staircase in connection with the verandah at the distal end of the ward.

The Main Ward.—In dealing with the main ward, we come first to the number of beds which should be placed in each ward. For the purposes of economical administration it is obviously advisable to have as many beds in a ward as is consistent with efficient nursing, as the multiplication of wards not only increases the number of the ward adjuncts (the most costly part of hospital construction), but also increases the number of nurses employed. On the other hand, diseases such as diphtheria and enteric fever require more nursing attention than, say, scarlet fever, and such a consideration must necessarily govern the number of beds to be attended to by one charge-nurse and her assistants. It may assist us to a conclusion to know that the specially appointed committee of the Metropolitan Asylums Board, after a most exhaustive inquiry, and after taking the opinions of those members of the medical profession most competent to advise upon the subject, came to the conclusion that the maximum number of beds to a ward should be 20 for scarlet fever and 12 for diphtheria and enteric fever, and I think we shall be justified in accepting these numbers as a satisfactory basis upon which to design the fever wards of the future.

The next point to be considered is the size of the ward, and here we must first deal with the cubic space per bed. In the Memorandum of the Local Government Board, already referred to, the suggested cubic space is 2,000 feet (apparently for all types of infectious disease), but I believe that most medical authorities are in favour of giving a larger cubic space to diphtheria and enteric fever, and I think that we shall be justified in allotting 2,500 feet to these two diseases. It will be found that this increase resolves itself into a question of increased floor-space, as the height of the ward is not varied. From the point of view of ventilation, the increase of cubic space is of little value, as fresh external air must be supplied to the ward in a fixed quantity per bed per hour, irrespective of the cubic capacity of the ward. There are three items to be arranged in connection with the cubic space, viz. the linear wall-space per bed, the floor-space per bed, and the height of the ward. There is now a general consensus of opinion against very lofty wards. In fact, a height of 12 feet would be sufficient were it not that with that height a long ward would present a somewhat dwarfed appearance, and I think that we may consider 13 feet as the most suitable height.

The next point to consider is the width of the ward. It is the general practice, at the present time, to design infectious wards with a width of 26 feet, that being an increase of 2 feet upon the accepted width of a few years ago ; but I must plead for a greater width in the future, say 28 feet at the least, as floor area in a ward is of great value. The width now suggested will not be considered excessive when it is mentioned that the wards at the celebrated Eppendorf Hospital at Hamburg are 28 feet wide ; at the Frederikshain Hospital, Berlin, 30 feet wide ; at the Urban Hospital, Berlin, 32 feet wide ; and, to take a most excellent example of modern hospital planning, the wards of the Derbyshire Royal Infirmary are 29 feet wide. None of these are

infectious hospitals, which makes the case even stronger. Ample width in a ward leaves room in the centre for fireplaces, tables, &c., without obstructing the passage-way at the foot of the beds, and, what is also highly desirable, admits of the beds being placed 12 or 18 inches clear of the walls, and thus clear of hot-water pipes, air-gratings, and draughts from windows. Assuming, however, that for the present we must be content with a width of 26 feet, and taking the height as 13 feet, we find that for scarlet fever a linear wall-space per bed of 12 feet will give a floor-space of 156 feet, and a cubic space of 2,028 feet, and that for diphtheria and enteric fever a linear



BLOCK PLAN.

Scale, about 300 feet to 1 inch.

1, Official Block. 2 to 9, Pavilions. 10, Ice-house. 11, Kitchen. 12, Laundry. 13, Coach-house. 14, Mortuary. 15, Stables.

SECTION A B.

Scale, 15 feet to 1 inch.

PLAN OF PAVILION.

Scale, 35 feet to 1 inch.

W, Ward. N, Nurse. K, Kitchen. L, Linen. P, Pantry. V, Verandah.

FIG. 10.—INFECTIOUS HOSPITAL, BUDAPEST [p. 280].

wall-space per bed of 15 feet will give a floor-space of 195 feet, and a cubic space of 2,535 feet. This will make a ward for 20 scarlet fever beds 120 feet long, and a ward of 12 beds for diphtheria or enteric fever 90 feet long. These dimensions and numbers of beds are, of course, for fairly large hospitals, but the wall-space, floor-area, and cubic space will be fixed quantities, applying to wards of any size. I may add that so long ago as 1882, in a Paper read before the Epidemiological Society, Mr. P. Gordon Smith, the architect of the Local Government Board, advocated a width of 26 feet for the wards of infectious hospitals.

The dimensions of the ward having been determined, some of its details may now be considered. The windows (which should be double-glazed to prevent loss of heat) should

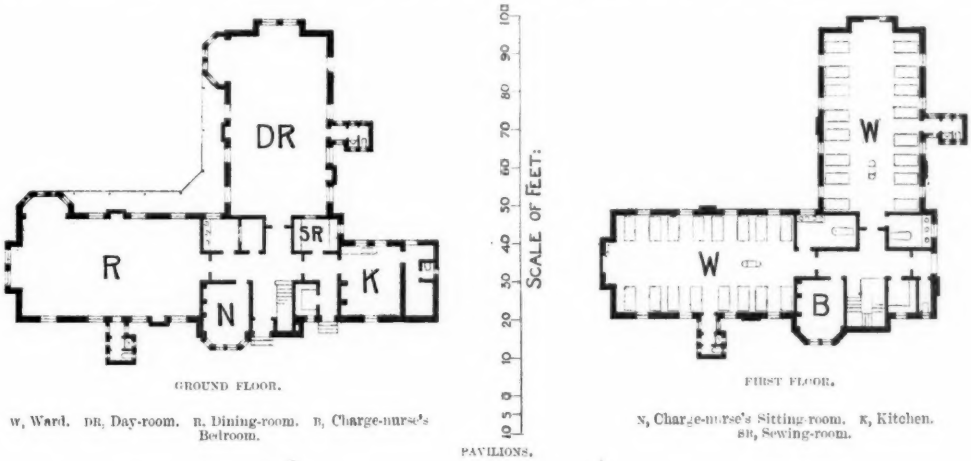
have an area of not less than 1 foot for every 70 cubic feet of ward-space. The wall-space of 12 feet admits of a window of ample size being arranged between each pair of beds, and it is also most desirable that there should be a window in each corner of the ward, between the last bed and the end wall. If the distal end of the ward can be arranged so as to face the south or south-west, so much the better, and there should then be glazed doors leading to a verandah. It is almost unnecessary to say that all internal angles should be rounded, and that, in fact, recesses, sinkings, and all arrangements involving internal angles should be avoided as far as possible. With this object in view, it is advisable to keep the window frames flush, or as nearly so as possible, with the internal face of the wall. A 9-inch external reveal in a 14-inch wall will ensure this.

The walls and ceilings of the ward should be finished with Keene's cement, and this, after an interval, should be painted and varnished. (All woodwork, also, should be varnished as well as painted.) A ward thus finished internally can be easily and frequently cleansed, without repainting. The importance of the frequent cleansing throughout of the wards of an infectious hospital cannot be overestimated. The floor of a ward is a subject upon which there is much difference of opinion. The requirements which a ward floor should fulfil are, that it should be impervious in character, should be capable of being easily cleaned without the application of much water, and should be cheerful in appearance. In this country wood floors are in general use, the preference being given to oak or teak wax polished. One great objection to wood floors is that they are necessarily full of joints, and as the wood shrinks, as it always will, these joints open and become the receptacles for impurities. On the score of brightness of appearance, oak is preferable to teak, but it is easily stained. Teak is undoubtedly by far the best of all wood floors, being hard, durable, and unaffected by moisture; but it is dark and dull in appearance, and detracts from the cheerfulness of the ward. I am inclined to think that a terrazzo floor is the most suitable for infectious hospitals. Such floors need not be considered as being in the experimental stage. I have seen them at the Eppendorf Hospital, Hamburg; the Moabit Hospital, Berlin; the Frederikshain Hospital, Berlin; the Urban Hospital, Berlin; and, to come nearer home, at the Derbyshire Royal Infirmary; and the testimony of the authorities of these hospitals is very strongly in favour of these floors. A well-laid terrazzo floor presents an even, polished, and impervious surface, bright and cheerful in appearance, and easily cleaned with a small quantity of water. No objection on the score of coldness is made by those who have used these floors, which indeed need only to be seen in order to be fully appreciated.

Ward Furniture.—It is very important that the furniture of a ward should be of a character not likely to harbour infection. For this purpose the most suitable materials are iron and glass, the use of wood being avoided as far as practicable. There should be a bedside table to each bed. This should be of galvanized wrought-iron light framing, with glass top. It will be convenient to have two medicine cupboards (one for poisons), and these should run on castors and should stand at least 6 inches clear of the floor. These cupboards should be of iron lined with glass. There should also be a doctors' testing and writing table fitted with drawers. Two good-sized tables will be required for ward use. It will be a convenient arrangement to provide a linen-wagon, in order that a suitable quantity of linen may be removed from the linen-store, and be available in the ward for immediate use. This should run upon iron wheels with rubber tyres. Movable screens are also required for ward use, of two sizes, the larger one about 5 feet high. These screens, which must be necessarily of very light construction, are best made of yellow pine skeleton framing covered with a washable textile material fixed with tapes. Coal bunkers should be provided to run upon wheels with rubber tyres. A variety of chairs should be provided, such as easy-chairs, rocking-chairs,

and plain chairs of different sizes for children, and all these are most suitable when of the plain bent-wood type. Wicker chairs harbour dust.

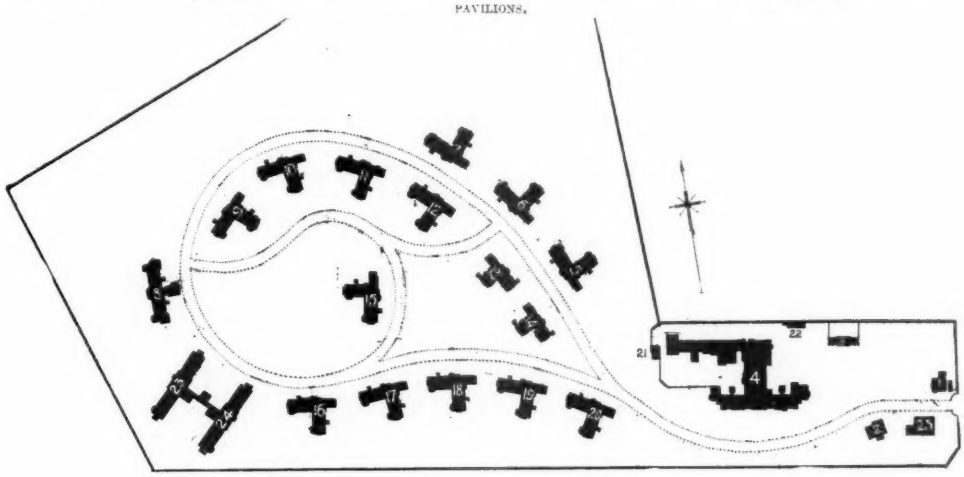
The Ward Adjuncts.—The ward adjuncts are the duty-room, the w.c.'s and sinks, the bathroom and lavatory, linen-store and larder. It is a convenient arrangement for the w.c.'s and slop- and scalding-sinks to be placed together in a turret separated from the



W, Ward. DR, Day-room. R, Dining-room. B, Charge-nurse's Bedroom.

N, Charge-nurse's Sitting-room. K, Kitchen. SR, Sewing-room.

PAVILIONS.



1, Steward's House. 2, Gardener's House. 3, Stables. 4, Administrative and Laundry. 5 to 20, 23, and 24, Pavilions. 21, Mortuary. 22, Workshops. 25, Doctor's Residence.

FIG. 11.—METROPOLITAN ASYLUMS BOARD CONVALESCENT HOSPITAL, WINCHMORE HILL [p. 280].

(Messrs. Pennington & Bridgen, Architects.)

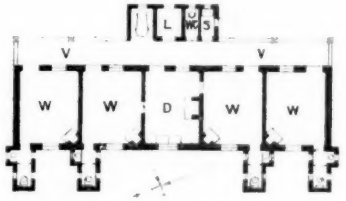
ward by an intervening lobby having windows on opposite sides. This lobby should be large enough for convenience of access, but not so large as to admit of ward chattels or refuse being placed there. This turret is placed in various positions by architects, some placing it at the distal end of the ward; but for convenience of administration I prefer to place it on the east side of the ward, about midway in the length of the ward. In this central position it is

more easily reached by both patients and nurses. This turret should have abundant cross-ventilation by means of windows in opposite walls, and also by means of brass or galvanized iron gratings placed in the external walls at the floor level. (The radiators of the warming apparatus can, with advantage, stand in front of these gratings.) The floor should be of terrazzo, laid with a fall to a glazed open shallow channel, discharging into an external vertical waste pipe, in order that the floor may be frequently flushed down with water. For the same reason the w.c.'s, sinks, and all other fittings should be of the "bracket" type, standing well clear of the floor, and the w.c. partitions and doors should be at least three inches above the floor, the former resting upon galvanized iron shoes. The walls of the turret and lobby should be lined throughout with light-coloured glazed bricks, all internal angles being rounded. Two w.c.'s will be sufficient for a ward of twenty beds, but one of these should have a smaller seat, and be placed at a lower level for children's use. A very good type of "bracket" closet is made by Messrs. Dent & Hellyer.

Two sinks are required in this turret: a slop-sink and a scalding-sink. A very excellent slop-sink has been designed by Professor M'Hardy and patented by Messrs. Dent & Hellyer [fig. 13 A, p. 296]. This sink not only serves the ordinary purposes of a slop-sink, but it is formed and fitted to enable bed-pans and urine-bottles to be easily washed and cleansed therein, without manual cleansing and unnecessary handling of the utensils, particularly valuable when it is desirable to reduce the risk of matter from such vessels, such, for instance, as the excreta of enteric-fever patients, coming into contact with the nurse's hands. The sink is made of strong glazed fireclay, with a cast lead "anti-D" trap, and has a flushing rim for the purpose of flushing down the sides and bottom of the sink, and cleansing the trap and charging it with clean water. The body of the sink is shaped conically to take bed-pans of various sizes, and is fitted with three ribs or strips of rubber for supporting the bed-pans in position while being cleansed. At the bottom of the sink a perforated inlet or rose is fixed, through which water is forcibly sprayed into the interior of the bed-pan, whilst the latter is resting in an inverted position, for dislodging the contents of the bed-pan, and thoroughly flushing it without splashing the surroundings. When it is required to cleanse urine vessels, a tinned metal cradle is hung upon a couple of hooks secured to the rim of the sink, upon which the vessel to be cleansed is placed, with its mouth opposite a metal jet fixed through the side of the sink, and provided with a separate supply for forcibly injecting hot or cold water, or a mixture of both, into the vessel to be cleansed. This sink is, however, very expensive, and, moreover, stands upon the floor, thereby interfering with the "bracket" principle. It has also a large amount of internal surface requiring to be kept clean.

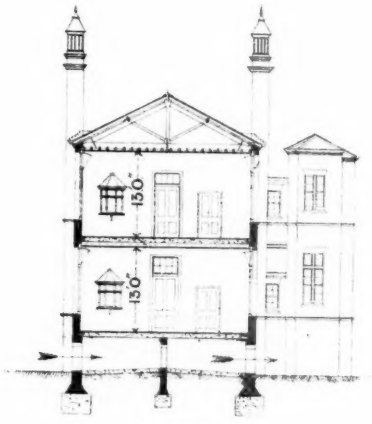
With a view to reducing the cost, and also of carrying out the "bracket" principle throughout, Messrs. Dent & Hellyer have, at my suggestion, quite recently produced another sink, to be much less costly, and for use where a separate scalding-sink for cleansing urine vessels and other articles is provided [fig. 13 B, p. 297]. In this sink the metal cradle and jet for cleansing the urine vessels are omitted, which enables the sink to be made much shallower than the M'Hardy sink, with this advantage, that there is considerably less surface liable to be soiled and requiring to be kept clean; the shallower shape, moreover, admitting of the sink being fixed as a bracket clear of the floor. There will be a flushing rim, and a jet at the bottom, in much the same way as in the M'Hardy sink; but instead of the sides of the sink being made conical, with rubber ribs, the back and front of the sink are bulged inwards to form a small ledge on each side of the flushing jet, upon which bed-pans of different sizes can be placed in an inverted position, when they are required to be cleansed, and the bottom of the sink around the jet and between the ledges is channelled and sloped towards the outlet, so that the matter from the bed-pan can readily escape when the flush is applied.

1 to 8, Scarlet Fever Pavilions. 9 to 12, Diphtheria and Enteric Fever Pavilions. 13 and 14, One-bed Isolation Wards. 15 to 18, Four-bed Isolation Wards. 19, Scarlet Fever Receiving Ward. 20, Diphtheria and Enteric Fever Receiving Ward. 21, Matron's Office and Sewing-room. 22, Nurses' Home Main Block and Matron's Residence. 23, Night Nurses'. 24, Assistant Day Nurses'. 25, Female Servants'. 26, Male Servants'. 27, Steward's Residence. 28, Kitchen and Stores. 29, Official Block. 30, Medical Education Rooms. 31, Laundry. 32, Boiler-house, &c. 33, Diphtheria and Enteric Fever Discharge Ward. 34, Scarlet Fever Discharge Ward. 35, Water Tower. 36, Porter's Lodge. 37, Doctor's Residence. 38, Mortuary. 39, Ambulance Station. 40, Pumping Station. 41, Workshops. 42, Rain-water Tank.



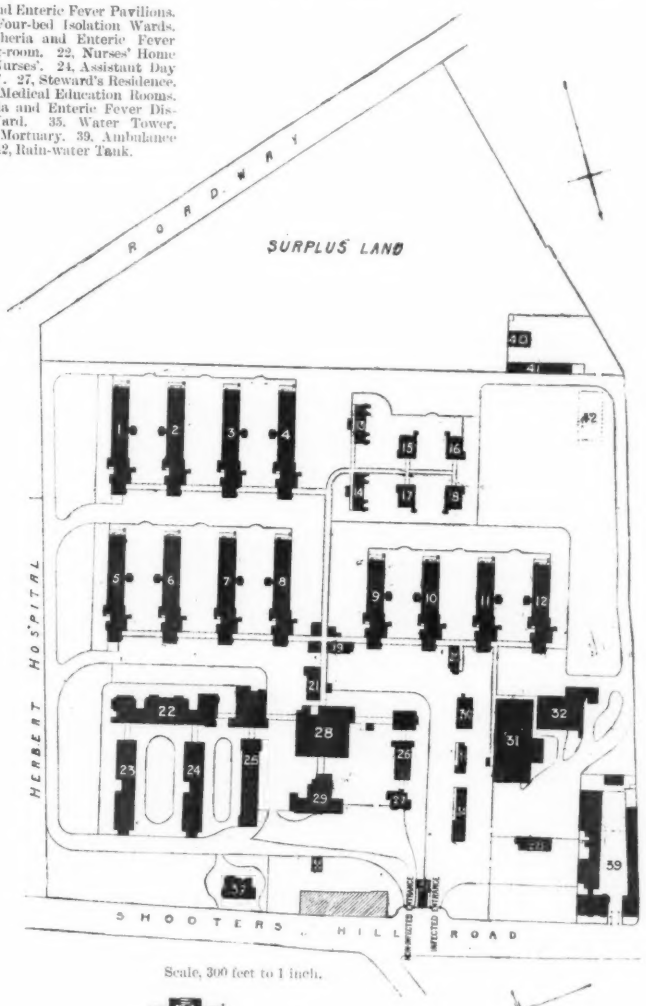
SINGLE-BED ISOLATION WARDS

Scale, 28 feet to 1 inch.

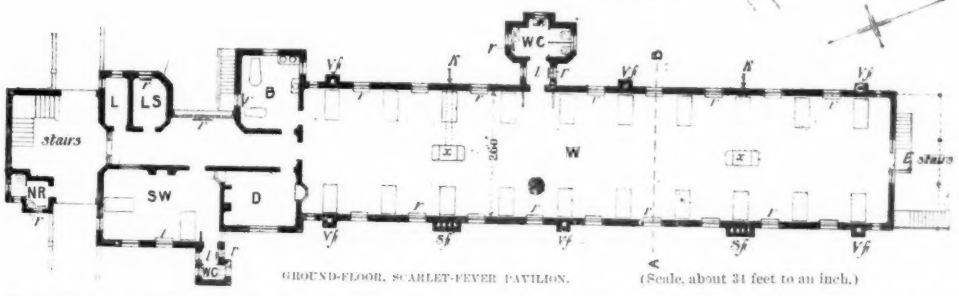


SECTION A B.

Scale, 26 feet to 1 inch.



Scale, 300 feet to 1 inch.



GROUND-FLOOR, SCARLET-FEVER PAVILION. (Scale, about 31 feet to an inch.)

W, Ward. SW, Separation Ward. D, Duty-room. B, Baths and Lavatory. WC, W.c.'s and Slop-sink. S, Slop-sink. L, Larder. LS, Linen Store. NR, Nurses' Robing-room. *Stairs*, Stairs to First Floor. *E. Stairs*, Iron Escape Stairs. V, Verandah. *l*, Lobby. *vf*, Ventilating Flues. *sf*, Smoke Flue. *r*, Radiator and Fresh-air Inlet. *x*, Double Fireplace (Ventilating). *k*, Fresh-air Inlet to Fireplace.

FIG. 12.—THE BROOK FEVER HOSPITAL, SHOOTER'S HILL [p. 284]. (Mr. T. W. Aldwinckle, Architect.)

The other sink required in the turret, to be called the "scalding sink," should also be of strong glazed fireclay, and be about 3 feet long, 2 feet wide, and from 10 to 12 inches deep, and should be fitted with metal rack, for the purpose of cleansing urine bottles. The general use of this sink will be for scalding the ward utensils and also for cleansing the mackintosh sheets. All slop and scalding sinks, and, indeed, sinks of all kinds, should not only rest upon galvanized iron brackets clear of the floor, but should stand at least 3 inches clear of the wall in order to prevent the lodgment of dirt between the sink and the wall. There should be placed over this sink a rack on which bed-pans can be placed to drain after cleansing, handle downwards. As bed-pans are uncomfortable to a patient when used quite cold, it will be convenient to make this rack of galvanised iron piping, forming a branch or extension of the hot-water warming apparatus, in order that the bed-pans can be warmed before use. There should also be in this turret a cupboard open at the back to outer air, for chamber utensils kept for examination.

Bath-room and Lavatory.—It is convenient to combine the bathing and lavatory work in one room of ample size, which can lead direct from the ward without an intervening lobby, although there should also be a doorway from the ward corridor. This room should be lined throughout with light-coloured glazed bricks, and the arrangements of floor ventilation should be similar to those in the water-closet turret. There should be two glazed fireclay baths, standing clear of the floor upon glazed feet; one of these should be of smaller size for children. There should be also one bracket lavatory basin for adults, and two on a lower level for children. It is a convenient arrangement to put the towel-rollers upon projecting brackets over the radiators of the warming apparatus. The bathroom is frequently placed at the distal end of the ward, forming a companion turret to the water-closet turret; but for working purposes I think it is preferable to place it at the administrative end of the ward.

Linen Store.—The linen-store should lead, not from the ward, but from the ward corridor, and should be well lighted and warmed.

Larder.—A larder is required for keeping milk, butter, cheese, eggs, cold beef-tea, and other cold daily food. It should have a north light and cross-ventilation. The walls should be lined with glazed bricks.

Duty-room.—The duty-room, or ward scullery, should directly overlook both the main ward and the separation ward. The floor should be terrazzo or tiles, and there should be a glazed-brick dado. This room requires a gas cooking-stove, a dresser, washing and rinsing sinks, and a cupboard for tea, sugar, &c.

Separation Ward.—There should be a separation ward on each floor for one or two beds. The use of this ward is for cases which, from special causes, require to be separated from the patients in the main ward, such as suspected onset of intercurrent infectious diseases; and it must not be confused with the isolation wards, to be afterwards described. The separation ward should adjoin, and be overlooked from, the nurses' duty-room; should have cross-ventilation, and its own separate and distinct w.c., and slop-sink with hot and cold water supply, with a ventilated lobby between these and the ward. The internal appointments to this ward should be similar to those of the main ward, and it should be so arranged in all its details as to be a separate, distinct, and fully equipped ward, as otherwise its value will be lost.

The Ward Corridor.—The corridor is necessary as a means of access to the ward, duty-room, bathroom, separation ward, &c., and should be arranged as short in length as possible, and should be well lighted, great care being taken to avoid dark corners, where ward refuse could be deposited. It is convenient to arrange a large bay-window on one side of this corridor. The corridor should be cut off from the main covered way and staircase by means of a glazed partition and door.

Nurses' w.c., &c.—In connection with each ward pavilion there should be a w.c. for the nurses, as also a lavatory and robing-room. These should have cross-ventilation, and lead from the covered way or staircase, or from the open air, but not in any case from the ward corridor. The robing-room is to enable nurses to change their home dresses for the ward uniforms, and *vice versâ*, so that the ward uniforms are never taken into the nurses' home.

Warming and Ventilation.—The warming and ventilation of the ward must be considered together as one operation. This subject must also be dealt with in close relation to climate. Ours is a temperate climate, and is free from those extremes of temperature which exist in, say, Germany and the United States. I mention these two countries because they possess some very complete systems of warming and ventilation, suitable doubtless to their own climates, but the application of which to our own surroundings would not necessarily be successful. The key to the whole position *here* is that for at least 300, if not 330, days in the year it is possible for us to open the windows of a hospital ward without danger or discomfort to the patient; and we must keep this fact prominently in view when dealing with the question of ventilation.

In considering the warming and ventilation of a ward pavilion, it is essential to begin with the principle that the wards and their adjuncts (except, of course, the larder) should all be kept very much at the same temperature, in order to avoid draughts being caused by the opening of doors. It is also necessary at the outset to decide as to the nature of the heating apparatus to be used, and whether the warming medium shall be water or steam. My own experience is most strongly in favour of low-pressure water apparatus, the water circulating from a steam-heater placed in the basement of each ward pavilion. The wards, then, should be warmed (*a*) by open ventilating fireplaces, and (*b*) by the diffusion of fresh external air, warmed by passing over hot-water heating surfaces in the wards. Objections are urged against open fireplaces on the ground that it is a wasteful means of producing heat; but I think that this drawback is much more than compensated for by the cheerfulness of the open fire, and by the very important fact, too frequently overlooked, that an open fireplace, with a fairly good draught in the chimney, is about the best exhaust ventilator that can be found, and one that acts near the floor level. These fireplaces should, in large wards, be placed back to back in the centre of the ward, and should have descending flues, so as not to obstruct the nurses' view down the ward. They should also be of the ventilating type—admitting, warming, and diffusing fresh external air, which should be brought in through glazed channels. A ward for twenty beds should have two pairs of these fireplaces.

The warming by open fireplaces should be supplemented by the admission of warmed external air at the sides of the ward. The external air is admitted through glazed channels in the external walls (by preference under the windows), passed over heated copper radiators, through a cast-iron case with movable front, and thus enters the ward. The inlet both of cold and warm air should be capable of regulation. These inlets should be further supplemented by galvanized-iron hit-and-miss or valvular gratings placed in the external walls at the floor level at the back of each bed. No attempt need be made to warm the air passing through *these* inlets. The main inlet of external air will, however, be by means of the ward windows. The ceiling of the ward should be flat, without beams projecting below. The windows should run close up to the ceiling line, and the upper portion (about one quarter of the full window height) should consist of a hopper-hung sash, the hopper sides being glazed and fitted close up to the ceiling. There should be means of regulating the width to which this sash will open. If these windows are thus opened on both sides of the wards, those on one side will act as inlets, and the opposite ones as outlets, in normal conditions of the wind. Any excess of wind pressure can be regulated by reducing the window opening.

The exhaust ventilation already described—viz. that by open fireplaces and open windows—can, with advantage, be supplemented by vertical shafts, carried up well above the roof ridge, and covered with some kind of terminal to prevent down-draught. These shafts should be of brick, glazed internally and with rounded internal angles, and a good upward current can be created by the insertion of a coil of steam or hot water. These shafts should each have two valvular openings leading from the ward—one at the ceiling line and one at the floor level—and these should be so adjusted in relation to each other that when one is open the other is closed. These ventilating shafts will be of considerable value when it is not possible to open the windows.

The warming apparatus should be capable of maintaining in the coldest weather a temperature of 60° Fahr. in the scarlet-fever wards, and 65° Fahr. in the diphtheria and enteric wards. In Germany and America a somewhat higher temperature is usually maintained. It is important that the apparatus be so arranged that it can be regulated and controlled from within the ward. The ward adjuncts and the ward corridor should be warmed by means of

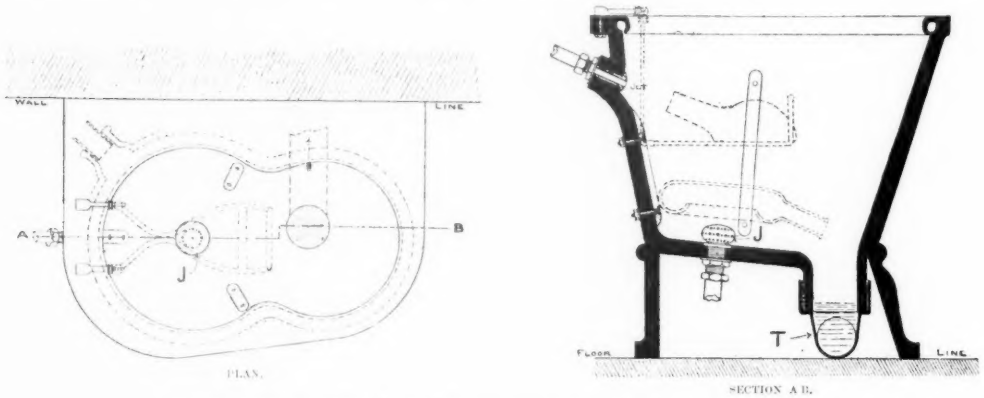


FIG. 13A.—THE "M'HARDY" BED-PAN-SINK AND SLOP-SINK (Hellyer's Patent) [p. 292].
T. Lead "Anti-D" Trap. J. Jet.

radiators placed against the external walls, and with air gratings at the back of them, so that fresh air can be freely admitted and warmed. It is very important that all ducts or channels for the supply of external air should be as short and direct as possible, and that they as well as the exhaust flues should be lined with glazed bricks.

In connection with the subject of the warming of wards, it may be useful to notice one of the methods adopted at the Eppendorf Hospital, Hamburg. This is supplementary to the general system of warming, which consists of fresh air warmed by passing through steam radiators. The method referred to is that of floor heating, and is based upon the principle of the ancient Roman Hypocaustum. Flues or channels about 30 inches square are constructed beneath the floor, and in these channels are placed steam-heating pipes. By this means the air in the channels is thoroughly warmed, as is also the ward floor, thus preventing a loss of ward temperature at the floor level. No air passes from these channels into the ward. The floors consist of terrazzo laid upon thin fireproof construction. This system of warming is extremely interesting in relation to the question of terrazzo floors. One possible objection to these floors in an infectious hospital is this, that the majority of cases being children it might be prejudicial to their recovery if they ran about with bare feet upon the (presumably) cold surface of the terrazzo floor. I am not prepared to admit that in a well-

warmed ward this floor need necessarily be cold, but if we can apply this system of floor warming all possible inconvenience would most certainly be avoided.

In connection with the subject of the ventilation of the wards of an infectious hospital, it will be interesting to bear in mind that so long ago as 1882 the Royal Commission appointed

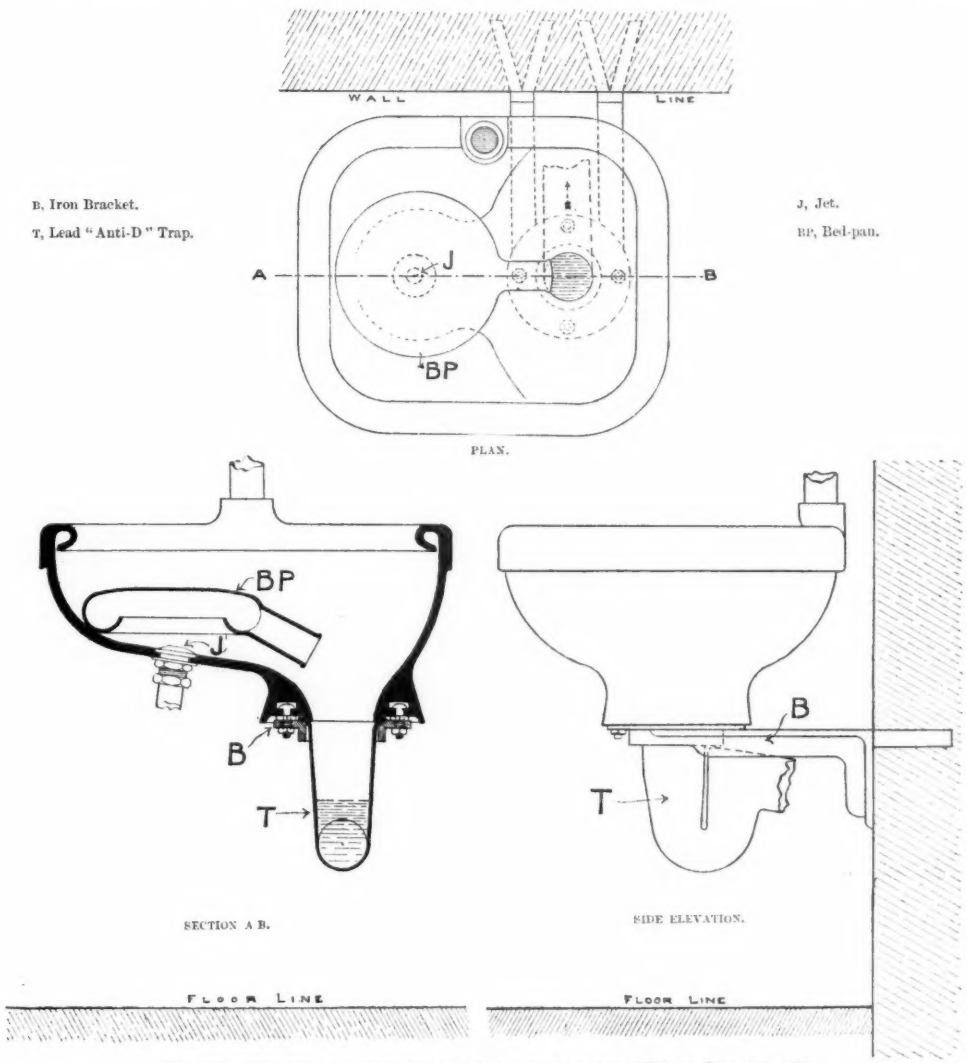


FIG. 13B.—THE NEW BRACKET BED-PAN-SINK AND SLOP-SINK (Hellyer's Patent) [p. 292].

to consider the accommodation for fever and small-pox in London suggested that hospital wards might be so constructed as to enable the air, after it has passed through the ward, to be subjected to a high temperature or some other means of destroying whatever dangerous properties it may possess, as recommended by Dr. Burdon Sanderson; but it was not until 1889 that any endeavour was made in that direction, when a small-pox pavilion was erected

at the Kendray Hospital, Barnsley, where the exhaust air was subjected to gas flame. Again, in 1890, a small-pox pavilion was erected at the Bagthorpe Hospital, Nottingham, where the outgoing air is sterilised by means of a large Bunsen gas burner in a central shaft. But by far the most interesting experiment has been made at the Bradford Small-pox Hospital, Bradford, erected in 1891–92 [fig. 14, p. 299]. The hospital comprises two wards, each 72 feet by 15 feet, placed back to back, but separated from each other by a central air-chamber 3 feet wide. This central air-space is divided, by means of horizontal partitions, into three chambers, one above another. Of these the two lower ones are placed below the level of the ward floors, and contain an arrangement for passing air into the wards after warming it, whilst the upper chamber is intended for the withdrawal of vitiated air from the wards. All the windows are hermetically sealed, and the fresh air is admitted solely by means of three shafts leading from the external air to the lowest compartment of the 3-foot space between the wards. Above this compartment is the second one, along which low-pressure hot-water pipes are laid for the purpose of warming the incoming air. From this compartment flues are carried to six openings in the floor of each ward, the openings being at the foot of each bed, and covered with gratings. In addition, flues from this compartment are carried to three openings in each ward, placed at the floor level in the wall of the ward opposite to the windows. Into the upper or vitiated chamber openings are provided at the ceiling level of the ward wall over each bed. A powerful furnace is placed in the cellar at one end of the ward, for the purpose of drawing the air out of the wards. The furnace is so arranged that a considerable portion of the vitiated air is used to promote the combustion of the fire, the remaining portion being passed through the furnace and exposed to a temperature of 800° F. before passing into the open air through the chimney. The rooms containing the bathrooms and water-closets are also connected with this system of exhaust. By this method it is considered that the exit air from the wards will be completely sterilised before reaching the open air.

A most interesting report upon the sterilising arrangements at these three hospitals—namely, Barnsley, Nottingham, and Bradford—has been made to the Local Government Board by Dr. F. W. Barry as the result of experimental tests made by him, from which the following extract will fairly describe the conclusion to which he arrived:—

> In all the hospitals hitherto referred to in this Memorandum the action of heat is depended upon for the extraction of the vitiated air along certain definite channels, and for the subsequent sterilisation of this air. At Barnsley and at Nottingham gas was employed for these purposes, but at both these places, as I have already noted, the process adopted failed to secure either of these results in a satisfactory manner. At Bradford, where the heat of a furnace was employed, it was found that, whilst the process adopted *failed to secure satisfactory results as regards sterilisation of the ward air*, a considerable measure of success was obtained in respect to the withdrawal of the vitiated air along certain definite channels at the time of experiment, when the working of the apparatus was under the careful control of the designer. It is, however, scarcely necessary to point out that, quite apart from the question of sterilisation, it is essential to the success of any method of artificial ventilation that its action shall be uniform at all times by night as well as by day, and when, as at Bradford, the system is dependent upon the efficiency of a stoker, uniformity in this sense cannot be regarded as secured.

In spite of this apparently unfavourable report, it is sincerely to be hoped that further attempts will be made to successfully sterilise the air escaping from small-pox wards. The subject is an important and interesting one, and ultimate success would be of great benefit to the community.

It is important, in the administration of a Fever Hospital, that foul linen and ward refuse should be placed in galvanized iron receptacles *outside* the ward pavilions, and that as frequently as possible the foul linen should be removed to the laundry, and the ward refuse to

the destructor, in order that these two sources of infection should never be deposited within the ward or its adjuncts.

Isolation Wards.—Isolation wards form a very important department of a Fever Hospital. They are required for the isolation of concurrent infectious diseases, such as scarlet fever and diphtheria, scarlet fever and chicken-pox, measles and diphtheria; for the isolation of intercurrent diseases which may occur during convalescence; for the isolation of single diseases,

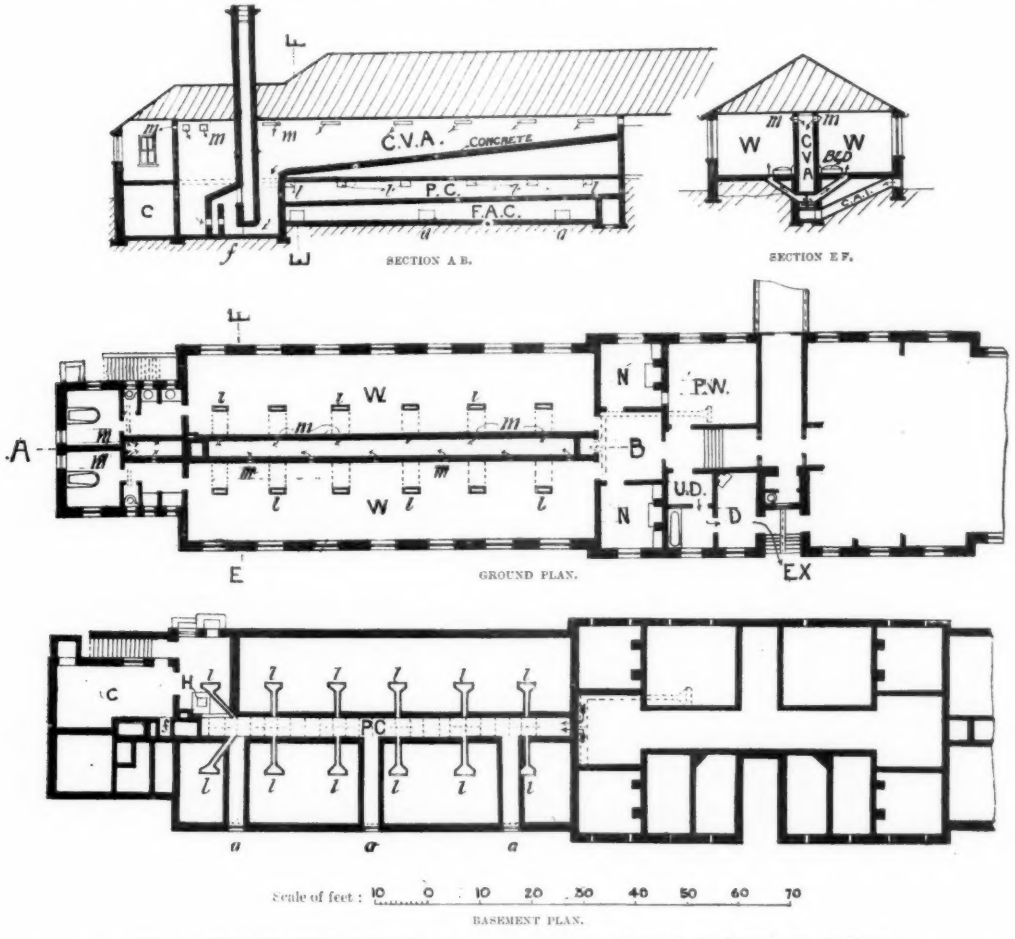


FIG. 14.—BRADFORD FEVER HOSPITAL: SMALL-POX PAVILION. (Messrs. Morley & Woodhouse, Architects.)

CVA, Chambers for Vitiated Air. PC, Pipe Chamber. FAC, Fresh-air Chamber. CAI, Cold-air Inlet. C, Cellar. *f*, Furnace. *a*, Cold-air Inlets. *l*, Fresh-air to Wards. *m*, Gratings at ceiling level for extract of Vitiated Air. H, Heating Apparatus. PW, Private Ward. W, Ward. N, Nurse. D, Dressing-room. UD, Undressing-room for Convalescents. EX, Exit for Convalescents.

such as measles, of too severe a type to be sent back from the hospital; and also for the isolation of cases of doubtful diagnosis.

In the smaller hospitals one isolation block will be sufficient, arranged somewhat upon the lines of plan B in the 1892 Memorandum of the Local Government Board [fig. 1, p. 271]; but in the larger hospitals it will be advisable to divide these isolation wards into two classes,

viz. those having wards for one bed, and those having wards for four or more. But, whatever may be the number of beds in a ward, it is imperative, even in the case of the one-bed wards, that each ward should have its own w.c., with the usual intervening corridor. Each isolation block should also contain a duty-room, covered space for movable bath (with means of emptying), larder, linen-store, slop-sink, and nurses' w.c. The internal finishings of these wards should be precisely the same as to the main wards, and each should have an open ventilating fireplace. In the case of the one-bed wards a verandah is useful to cover the access from the duty-rooms to the wards, and this should face towards the west if possible.

Airing-courts.—It is very important that all airing-courts should have ample sunshine, and should, as far as possible, be protected from the north and east winds. They should be paved with tar paving, with occasional flower-beds in the centre. It is important that the paving of these courts, where abutting against the walls of the ward pavilions, should be of impervious material, and not of grass, nor, indeed, flower-beds. The airing-courts should be so arranged that the patients of different diseases do not mix. This consideration will, of course, also govern the grouping or isolation of the ward pavilions.

Discharge Wards.—It is very important in a Fever Hospital to take all necessary precautions to prevent the spread of infectious diseases by patients who are leaving the institution. For this purpose discharge wards are provided. They comprise an undressing-room, where the patient removes the hospital clothes previous to bathing; the next room is the bathroom; and the third room is the dressing-room, in which the patient resumes his own clothes, which during his illness have been disinfected and kept in the clothes store adjoining. There should also be a waiting-room for friends of patients. These wards should be lined throughout with light-coloured glazed bricks. Two separate wards are required, one for scarlet fever and the other for diphtheria and enteric fever, and both wards should be as near as possible to the porter's lodge.

Mortuary.—The mortuary should be as near as possible to the entrance, so as to avoid the parading of funerals on the hospital premises. In addition to the mortuary proper there should be a post-mortem room, with a north light, and a room from which (through a glazed partition) friends can view the body placed in a small chamber leading from the mortuary. The walls throughout should be lined with light-coloured glazed bricks, and the floor should be of terrazzo or asphalte.

Having followed the patient through the hospital from entry to departure, we now deal with the administrative department, which may be described as comprising all buildings which are not occupied by patients. The *personnel* of the administration will vary with the size of the hospital, but, except in the case of the smaller institutions, there will always be a medical superintendent, a matron, a dispenser, a steward, an engineer, a cook, a laundry mistress, and a staff of trained nurses, and male and female servants, and all these must be housed and fed. But, whatever may be the size of the hospital or the number of the staff, it is equally important that the staff quarters should be placed in a position free from, and unsurrounded by, the ward pavilions or any other infected buildings. This is especially necessary in the case of the nurses, as they pass a considerable time in the vitiated atmosphere of the wards, and it is therefore most desirable that when off duty their surroundings should be healthy and cheerful. A high percentage of sickness amongst the nursing staff is wasteful, as it necessitates the employment of a large number to take the place of those who are ill, and thus maintain working efficiency.

The Medical Staff.—In the smaller hospitals the medical superintendent can reside in the official block, but in the larger institutions he should have a separate house, placed as near as possible to the boundary. His office should be in the centre of the hospital, near to those

of the matron, dispensary, and night superintendent nurse; in fact, this should be the working centre of the institution, and the centre of all electric bell and telephonic communication. If there be assistant medical officers, their sitting- and bed-rooms can conveniently be placed in the official block.

Kitchen and Stores.—The kitchen and stores should be as centrally placed as possible, and the matron's department, which is a very important one, comprising linen-stores and needle-rooms, should be of ample size and well warmed.

The Nurses' Home.—In a small hospital the nurses can be provided for in the administrative block, but in the more important institutions it is requisite to provide a distinct and separate nurses' home. The number of nurses in proportion to patients varies considerably; but the tendency at the present day is to raise rather than lower the proportion. At the Grafton Street Hospital, Liverpool, there are 15 nurses to 69 patients, or less than 1 to 4; while at the new Ruchill Infectious Hospital, near Glasgow, it is proposed to have 202 nurses for 440 patients. In each of the three new hospitals of the Metropolitan Asylums Board there will be 194 nurses for about 500 patients, or about 2 to 5.

It is convenient to divide the home into three separate blocks. The first, or main block, should contain the mess-rooms, general sitting-rooms, and recreation room, the matron's quarters, and also the bedrooms for the day charge-nurses. The second block should contain the bedrooms for the day assistant nurses, and the third block should contain the bedrooms for the night nurses, both charge and assistant. The mess-rooms, sitting-rooms, and recreation room should have a southern aspect if possible, and there should be no rooms over these, in order that they may be lofty and have open roofs. The block for the night nurses should be placed as far as possible from all noisy surroundings. Each nurse should have a separate bedroom, size about 13 feet by 8 feet 6 inches, with an angle fireplace. As these bedrooms will most probably be arranged on both sides of a fairly long corridor, it is a good arrangement to omit, say, two bedrooms on the sunny side of the corridor, and to put in their place a large bay window for light and air to the corridor. It is also well to make the windows at each end of this corridor the full height and width of the corridor. It is advisable to have a few spare bedrooms, to be used as sick-rooms as occasion may require. Each block should have a fireproof staircase at each end, so as to ensure escape in case of fire. Baths should be provided in the proportion of 1 to 8. The whole of the corridors and staircases should be thoroughly warmed.

In connection with the subject of accommodation for the nursing staff, there arises the question as to what provision should be made for the nurses when they are ill. Slight cases of indisposition can be dealt with in their own bedrooms, but cases of longer illness must be separately dealt with. It is useful to have two or three spare rooms in a nurses' home, of good size, for ordinary sickness; but cases of infectious disease must, of course, be removed. There are objections, possibly somewhat of sentiment, to placing nurses in the ordinary wards, and it may therefore be desirable, in a large hospital, to arrange a nurses' infirmary in, say, three small blocks, one for scarlet fever, one for diphtheria, and one for enteric fever. These wards should, of course, have the same adjuncts as the hospital wards, and should obviously be far removed from the home, and preferably near to the isolation wards.

Male and Female Servants.—The female servants should also have a separate home, under the resident control of the housekeeper, and the male servants a home under the resident control of the steward. These, however, can sleep in cubicles. It is important that the stewards' quarters should be so placed that they overlook the store-yard.

Laundry.—The laundry is a very important department in a Fever Hospital. In position it should be well removed both from the wards and from the staff quarters. It must be

divided into two separate and distinct departments, one for the staff and one for the patients. The staff laundry should be the ordinary type of a high-class steam laundry, with all the usual appliances. But the patients' laundry requires more serious attention. The infection of the hospital is virtually concentrated here. In some hospitals all articles coming from the wards are put through the steam disinfector, but such a course would appear to be unnecessary and destructive. In a well-arranged hospital steam laundry the ordinary clothes can be boiled under steam pressure in revolving washing-machines, and this should suffice. But the articles which are soiled by excreta must, in the first instance, be separately dealt with. These should be placed in steeping tanks adjoining the patients' wash-house, arranged somewhat after the manner of those in a tanyard. These tanks should be classified for "scarlet fever," "enteric fever," "diphtheria," "isolation," and "special," and there should be two tanks of each class, one for linen and cotton articles, and the other for woollen articles. Each tank should be separately warmed and drained.

The patients' wash-house should be large and well lighted, the walls lined throughout with glazed bricks, and the steam should be extracted by means of a fan. The floor should be paved with terrazzo or asphalte. The floor channels to carry off the waste water should be wide, with a good fall, with glazed inserts and sides, finished at the floor level with galvanized iron open gratings. These channels should discharge into one or more large grease traps just outside the building, *as there should be no closed drains within the wash-house*. It is a good plan to provide means for flushing out these channels with a rapid volume of water, and also to provide a hydrant and hose for flushing down the wash-house floor. The steam washing apparatus required comprises washing-machines, boiling-coppers, rinsers, and wringers, hydro-extractors, soap-boilers, &c. In drying the articles, either by means of drying-horses or of drying-chambers, the heating power must necessarily be by steam, and the principal consideration is to pass a sufficient quantity of dry air through the horses or chambers by means of a fan. All ironwork in connection with the horses or chambers should be galvanized, and the walls should be lined with salt-glazed bricks. The use of steam machinery enables us to economise space in the wash-house, but in the ironing-room a large floor-space is very desirable, as here the operations of steam-ironing, mangling, sorting, folding, and issuing are carried on. The room should be well lighted, the walls should be lined with light-coloured glazed bricks, and ventilation should be obtained and the steam removed by means of a fan. It is of the utmost importance that the whole of the laundry buildings should be well lighted and ventilated, so as to ensure the most absolute cleanliness, and that the several departments be so arranged that the foul linen shall pass in at one end of the laundry and the cleansed linen pass out at the other end, no articles returning through any room through which they have once passed. It is also convenient for the purposes of supervision that there should be large windows between the wash-house and the ironing-room, and also between the staff laundry and the patients' laundry.

Disinfecting Apparatus and Destructor.—All the patients' own clothes, together with a good deal of bedding, &c., from the wards, require to be disinfected. A very efficient apparatus is the steam disinfector patented by Mr. J. Washington Lyon. It is made in several sizes, but the largest size is required for an infectious hospital; superheated steam is generally used. The apparatus stands in the centre of the disinfecting house, a cross-wall of brick dividing the house into two rooms, half of the apparatus standing in one room and half in the other. The room in which the clothes are received is called the infected chamber, and the other the disinfected chamber, there being no communication between the two chambers except through the apparatus. The officer who places the infected articles into the apparatus has no further dealings with them, the disinfected articles being received on the other side by another

attendant. This house is sometimes provided with a bathroom for the use of the attendants. This bathroom must lead from the outside, and not from either of the chambers.

It must be obvious that the ordinary dust-cart can have no transactions with an infectious hospital. Clinkers from the boilers and ashes from the fireplaces can be safely removed from the hospital, but with these exceptions all refuse must be destroyed. For this purpose a destructor is required, in which everything can be burned. These require to be very carefully designed and constructed, or they may become very offensive, and care must be taken to produce a powerful draught for the furnace. This can be accomplished by placing the destructor in connection with the boiler chimney shaft. The disinfector and the destructor should adjoin, in order that one attendant may work both, and, as a matter of hospital administration, they should both be near the laundry.

Students' Department.—It is now a part of the medical curriculum that the student in medicine must study for a certain period in a Fever Hospital, and it is therefore necessary to make the proper arrangements for the same. There should be a well-lighted lecture-room, a room for the student's own clothes, and a room for the overalls which have to be worn when visiting the wards, together with lavatories and w.c.'s.

Drainage.—A complete, perfect, and efficient system of drainage is an essential for every hospital, whether infectious or not, so that all that one need do is to emphasise the importance of good flushing and good ventilation. One point, however, can be mentioned. As enteric fever is capable of being communicated by means of the excreta from enteric patients, a disinfecting apparatus is sometimes arranged to separate and disinfect the soil drainage from the enteric fever wards before it connects with the remainder of the drainage system of the hospital. This has been done at the Northern Fever Hospital, Winchmore Hill, but there appear to be mechanical difficulties in its working. One other point is this: there is always a large volume of hot soapy water draining from the laundry. This, if it enters the general system of the hospital, has a tendency to raise the temperature inside the drains and manholes, and it is therefore as well, when practicable, to run a separate drain direct from the laundry to the public sewer. This is being done at the Brook Hospital, Shooter's Hill.

Lighting.—The artificial lighting of a ward deserves careful consideration. The use of the electric light is now becoming so general in public buildings that we need scarcely discuss gas except as a reserve. The lighting of a ward can be divided into two sections: (*a*) the light necessary for the proper administration of the ward by the nurses; and (*b*) the light necessary to enable patients to read or otherwise occupy their time. Section (*a*) can again be subdivided. Central lighting is necessary for the general illumination of the ward, and side lighting is necessary for clinical and other purposes. The central lighting should consist of incandescent lamps suspended about five feet below the ceiling, fairly distributed down the length of the ward, the concentration of light into brilliant points being objectionable to the patients. Two or three of these central lights should be capable of being lowered close down to the doctors' or nurses' tables. For clinical purposes lights should be arranged on the side-walls, say one to each pair of beds, and each should be capable of being turned on and off. The general lighting of a ward should be so arranged that during the night all lights could be switched off, except a few points sufficient to enable the nurse to perform her ordinary ward work. As regards the remainder of the hospital, it will only be necessary to point out that the covered ways and yards, and all means of communication between the several buildings, should be well lighted.

Telephonic and Bell Installation.—A complete and well-planned system of electric inter-communication between different parts of the institution, by means of telephones and bells, is of the highest importance to the efficient administration of any large Fever Hospital.

Telephonic communication should be established between all departments which are constantly associated in their working. The same means of inter-communication should be provided between the principal officers, each of whom should be enabled to summon, by means of a bell, the subordinate officials who are directly responsible to him for their section of the work. Also, as far as can be, each member of the subordinate staff who is localised in any particular part of the buildings should be able to summon his subordinate chief in case of necessity. This is most important as regards the charge-nurse of each ward and the superintending nurse, and as regards those in charge of the boilers, kitchen and laundry machinery, and the engineer.

In order to effect the administrative facilities referred to, the medical superintendent's office should be connected by telephone with the steward's office, the matron's office, the assistant medical officer's quarters, the gate porter's lodge, and the receiving-room, close to which is placed the superintendent nurse's office. Now it is most desirable that the telephonic installation should be on the inter-communication system rather than by means of a central exchange, as the latter method necessitates the constant employment of an extra person to work the exchange, having in view the frequency with which the officials at some of these points will need to communicate with each other, particularly the receiving nurse or night superintendent with the assistant medical officers, the steward with the gate porters, and matron with the steward. The installations laid down by the Private Wire and Telephone Installation Company, and recently by the National Telephone Company, have been found to work admirably in practice. A bell-call should be provided from the medical superintendent's office to the porter's quarters, the engineer's residence and the housemaid's pantry; from the matron's office to the housekeeper's quarters, the kitchen, the laundry, the needle-room, and the housemaid's pantry; from the steward's office to the stores, the engineer's residence, and the porter's quarters.

The receiving-room and superintendent's office being the centre for the ward supervision, in addition to its telephonic communication with the medical superintendent's office, the assistant medical officer's quarters and the gate porter's lodge should be provided with a bell-push connected with each separate ward, and also a bell, with a clearly marked indicator board, which can be rung from each of the wards, for the purpose not only of answering the bell-ring from the receiving-room, but also to enable every charge-nurse at night to summon the superintendent night nurse. A bell-call should also be provided in the laundry and kitchen to ring in the engine-room or boiler-house, the code of signals in reference to the supply of steam or motive power being previously arranged. It is desirable, moreover, that a switch should be provided in the medical superintendent's office by which the telephone and bell-pushes can be switched on to his house when desired, and another switch by means of which the receiving nurse, on going to her meals, can cause the bell-pushes outside receiving room and inquiry room to ring in the mess-room for such time as she may be there. An installation laid down on the lines above suggested will fully meet the requirements of a large Fever Hospital.

Cost.—The cost per bed of a Fever Hospital is a subject upon which much definite information cannot very well be given, as the standard of hospital requirements has been considerably raised of late years and is apparently still rising. One important element in this connection is the largely increased accommodation provided for the hospital staff as well as the largely increasing proportion of nurses to patients. The Salford Sanatorium cost £375 per bed; the Heathcote Infectious Hospital at Leamington cost £8,400, or £385 per bed; the Willesden Isolation Hospital cost £16,000, or £380 per bed; while the three new hospitals of the Metropolitan Asylums Board will not cost much less than £400 per bed, and the new

Infectious Hospital at Ruchill, Glasgow, is estimated to cost a little over £400 per bed. These figures are exclusive of the site in each case. Large cubic spaces per bed in the wards and the necessarily complete sanitary arrangements of all well-designed Fever Hospitals account largely for their high cost as compared with general hospitals; but these are fixed and definite requirements which cannot be reduced if the efficiency of the hospital is to be assured. It cannot, however, be too strongly pointed out that, as the internal requirements of an infectious hospital are necessarily so costly, the architect should studiously avoid unnecessary expenditure upon architectural display, either external or internal.

Ambulance Stations.—In provincial fever hospitals, stables, coach-houses, and the usual appurtenances have to be built in connection with the ambulance service.

In London the ambulance system of the Metropolitan Asylums Board is the most complete and fully equipped institution of the kind in the world, and no Paper dealing with the provisions for the infectious sick would be complete without a description of its origin, development, and present administration.

Attention had been frequently drawn in the earlier days of the Board's work to many defects in the arrangements for the removal of patients from their homes to the Board's hospitals. The duty of this removal rested with the several Boards of Guardians, and the methods adopted by these authorities naturally differed in important details. The vehicles were in some cases the property of the Guardians, in others of the Vestry or District Board, and in other cases were hired for the occasion. They were generally defective in construction, and unsuitable for the safe transport of persons prostrate with infectious disease. In many instances the carriages were, after use, housed in a manner most dangerous to the public health, as, for example, where a carriage, after having been used for the removal of a small-pox case, was returned to the job-master's yard. Frequent complaints were also made as to carriages conveying infectious patients stopping outside public-houses, into which the drivers and the patient's friends went for refreshments. Moreover, difficulty was frequently experienced in obtaining a carriage when required, and the delay thus caused was a serious evil in itself. Nurses to accompany the sick were seldom provided; in most cases the patients travelled alone, and occasionally reached the hospital in a dying condition. Not infrequently they were accompanied by friends, not always sober, who returned home in public conveyances. These circumstances were, in due course, brought to the notice of the Local Government Board, with the result that the Asylums Board, by an Act passed in 1879, were authorised to establish an ambulance system of their own. In 1881 the Board commenced tentatively by opening an ambulance station at London Fields, Hackney, for the removal of small-pox cases only. This was eminently successful, and was subsequently removed to the present premises adjoining the Eastern Hospital, and by degrees the system was extended to the whole Metropolis and to all dangerous infectious disease. All the hospitals, ambulance stations, and wharves are in telephonic communication by private wire with the head office at Norfolk House, from which also the National Telephone Company's Exchange system is connected.

In this connection I now show you a large diagram map [*see plate*] showing the ambulance system in London. In this diagram the ambulance stations are shown by "hatching," the wharves by the small red disc; the telephonic lines connecting the hospitals, ambulance stations, and wharves with the central office in Norfolk Street, Strand, are shown by blue lines, the lines of land transport from the hospitals to the wharves are shown by a red dotted line, and the lines of river transport from the wharves to the floating hospital are shown by a green dotted line.

The ambulance arrangements may be conveniently considered under the following heads:—(1) Land service; (2) river service; (3) removal and distribution of patients.

1. Land Service.—There are at present three permanent ambulance stations—viz. adjoining the Eastern, the Western, and the South-Eastern Hospitals, and a small temporary station at Tooting. Another station is in course of erection adjoining the Brook Hospital at Shooter's Hill, and stations are also to be built adjoining the Park Hospital, Hither Green; and the Fountain Permanent Hospital, Tooting.

Each ambulance station contains a residence for the superintendent and housekeeper, who are man and wife, sleeping accommodation and mess-rooms for nurses and for the male and female staff, a kitchen, a laundry, general stores and equipment room; also stabling for from fifteen to twenty horses, and coach-house for from twenty to thirty carriages, omnibuses, and an accident cart.

2. River Service.—This is exclusively for cases of small-pox, and consists of three wharves for the embarkation of patients—viz. the West, at Fulham; the North, at Poplar; and the South, at Rotherhithe. There is a floating pier at each wharf, approached by a bridge, and so placed that there is sufficient water to allow the steamers to come alongside at all times of the tide. On each wharf there is a covered shed into which the ambulances drive, with an examination room. If the medical officer of the River Service considers the patient to be in a condition to bear the journey to the floating hospital, he is placed in bed on board one of the steamers. The wharf at Rotherhithe (South Wharf on map) is the headquarters of the River Service. Here is the office of the river superintendent, and here are moored the ambulance steamers, the *Red Cross*, the *Maltese Cross*, and the *Albert Victor*; a fourth steamer, the *Geneva Cross*, has recently been built. In all these steamers there are separate cabins for the nurses, and the requisite appliances for the treatment of severe cases, as well as for the supply of appropriate nourishment. On deck there is a cabin for the medical officer. The speed of the steamers is about ten knots, and the journey to the floating hospital occupies from one and a half to two hours.

3. Removal and Distribution of Patients.—Under this ambulance system, the removal and distribution of patients are as follows:—In order to obtain the removal to a hospital of a case of small-pox, fever, or diphtheria, the medical practitioner in attendance, finding that the patient cannot be safely isolated and treated at home, certifies to this effect. Application is then made to the ambulance office at Norfolk House, by telegram or otherwise, stating the name of the patient, the age, sex, disease, and address. These particulars are immediately communicated by telephone to the ambulance station nearest the abode of the infected person, and within three minutes an ambulance with a nurse, and, if the patient be over ten years of age, a male attendant, is *en route* to remove him. On arrival at the house, the certificate of the medical practitioner is handed to the nurse, without which there is no removal, and the patient is carefully placed in the carriage. A "notice" is given to the relatives or friends, informing them to which hospital the patient will be taken, as well as a copy of the "regulations" relating to the information which will be given by the medical superintendent of the hospital as to the conditions and progress of the case, and also a copy of the "rules" for visiting patients when dangerously ill, as well as for their discharge when recovered. On arrival at the hospital, the patient is examined by the medical superintendent, and a notice of his or her safe arrival is sent to the friends. Plenty of blankets and a basket carrying milk and stimulants are sent in each ambulance, and in cold weather large hot-water foot-warmers are also supplied. Cases of small-pox are taken, in the first instance, to one of the wharves, where they are examined. If the diagnosis made by the "certifying "medical practitioner" be confirmed, and if the patient be in a fit condition to bear the journey to the floating hospital, he is carried to the ambulance steamer, placed in bed, and conveyed to the ships at Long Reach. The managers of the Metropolitan Asylums Board, fully appre-

ciating the danger of an invasion of the Metropolis by epidemic disease at any time, and believing that the prompt removal of such cases as may occur is of the utmost importance, maintain an organisation in constant readiness by which they are able to place, at any hour of the day or night, with the least possible delay, a fully equipped ambulance in charge of a careful driver, and with an experienced nurse, at the door of any house within the metropolitan district—a district extending over an area of 120 square miles, and containing more than half a million dwellings, inhabited by a population of nearly four and a half million people.

Since the Asylums Board established this ambulance service, their vehicles have effected very nearly 200,000 removals (including transfers, &c.) without accident or injury to any patient, and this notwithstanding that the removals have been carried out in all weathers and throughout all seasons of the year, and, to a great extent, during the night hours.

The Brook Ambulance Station [fig. 15].—This ambulance station is now in course of erection on land adjoining the new hospital at Shooter's Hill, and comprises a superintendent's residence and offices, stabling for sixteen horses, coach-houses for twenty

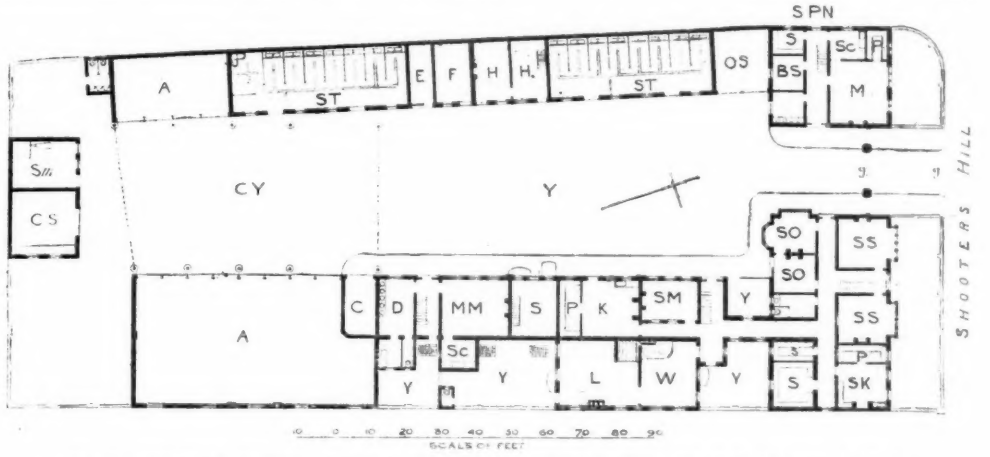


FIG. 15.—THE BROOK HOSPITAL, SHOOTER'S HILL: THE AMBULANCE STATION. (Mr. T. W. Aldwinckle, Architect.)

SO, Superintendent's Offices. SS, Superintendent's Sitting-rooms. SK, Superintendent's Kitchen. W, Wash-house. L, Laundry. K, Kitchen. MM, Men's Mess-room. SM, Servants' Mess-room. D, Men's Dressing-room. C, Cleaning-room. SPN, Small-pox Nurses' Quarters. M, Small-pox Nurses' Mess-room. A, Ambulance Sheds. ST, Stables. OS, Open Shed. CS, Carpenter's Shop. SM, Smithy. Y, Open Yard. CY, Covered Yard. SC, Scullery. S, Stores. P, Pantry. BS, Blanket Store. E, Equipments. F, Fodder. H, Harness. g, Gates.

ambulances, a home for eight small-pox nurses, mess-room and cubicles for twenty male servants and drivers, mess-room and cubicles for five female servants, general kitchen and store, smithy and wheelwright's shop. The walls of the stables internally have a dado of blue Staffordshire bricks, and above the mangers are lined with glazed bricks. The whole of the yard will be paved with asphalte, and a portion will be covered with a roof of glass and iron for the convenient cleansing of the ambulances.

As indicating how important to the welfare of the community at large, and to the prosperity of the Metropolis in particular, is the provision of adequate accommodation for the prompt isolation of cases of infectious disease, I cannot more fittingly close this Paper than by quoting the following weighty words on this subject with which the Chairman of the Metropolitan Asylums Board (Sir E. H. Galsworthy) concluded his last Annual Report :—

Another matter in connection with this, the most important, part of the Board's work ought not to be overlooked—viz. the bearing it has upon the prosperity of the Metropolis, and the share it must necessarily have in conducing to the maintenance of its reputation as one of the healthiest cities of the

world. Should the Metropolis ever be allowed—either through indifference on the part of its citizens, or through unwillingness on the part of those responsible to them, to incur the expenditure necessary for the provision of isolation hospitals—to become a fever-stricken city, the result cannot prove otherwise than disastrous to its commerce and to the well-being of its inhabitants.

DISCUSSION OF MR. ALDWINCKLE'S PAPER.

The President, FRANCIS C. PENROSE, F.R.S., in the Chair.

MR. P. GORDON SMITH [*F.*] said the Paper dealt so largely with the gigantic hospitals of London, that it left a great deal to be said, if time permitted dealing with the smaller hospitals that exist and have yet to be built in all parts of England and Wales. Mr. Aldwinckle being so intimately connected with the isolation hospitals of London, it was only natural that he should have gone more particularly into the question of large hospitals. When the size of the Metropolis was considered, and its enormous population, it would be seen what an exceptional condition of things had to be dealt with in providing isolation hospitals for London. The hospital authority for London, again, was quite exceptional: it was unique in possessing among its members several eminent hospital experts. One therefore hesitated a good deal to criticise the hospitals they had built and were about to build. Again, in addition to the experts in hospital construction and management, who were members of the hospital authority of London, there was a staff of consultative medical superintendents of hospitals, possessing much experience in regard to these hospitals, and whose opinion must always carry great weight. There were so few large hospitals elsewhere than in London that he was rather sorry Mr. Aldwinckle should have dealt, almost exclusively, with the subject of large hospitals; but there was a good deal that he had referred to as being necessary and desirable in large hospitals which was altogether inappropriate and inapplicable in the case of small hospitals, and therefore he should be sorry if the Paper were accepted without caution by architects who were designing comparatively small hospitals of, say, 20, or 30, or 40 beds. Mr. Aldwinckle had recommended two entrances. He thought that, however desirable it might be to have two entrances to a large hospital, it was altogether out of place in a small hospital, and he himself should never recommend it. There were other points. The discharge rooms as a distinct block, for instance, in a large hospital were perhaps indispensable; but they had to bear in mind that small provincial hospitals were built by local sanitary authorities who had not the same grand idea of heroic provision for hospitals that was entertained in London, and who had to consider every item of cost most carefully. As regards the discharge rooms, there was a plan, illustrated in the Heathcote Hospital at Leamington, showing an arrangement by which patients are discharged direct from the bathroom of the ward block by means of a casement window; and this, as a rule, answered every purpose fairly well; but in the case of a large hospital, where it was more worth while to provide a separate building for the purpose, it was desirable to do so. Then the maximum size of a hospital had been referred to; that, he thought, was hardly a question for architects to discuss, although he should like a limit to be fixed. The Asylums Board had decided on 500 beds, but even that they exceeded, and he felt confident that 500 was too high a maximum. Coming to the question of cost, the architects of the great London hospitals were fortunate in having for clients a body having practically unbounded wealth, and a strong desire to provide everything that there could be any excuse for saying was necessary. It was, of course, totally different when they had to provide a large hospital which was to be paid for by voluntary contributions; in such hospitals they had to be satisfied without a great many things that were considered indispensable in the large public institutions in London; and yet they got on very well, and their statistics showed that the condition of the patients was found to be fairly satisfactory, and to compare favourably with those in hospitals built at a cost which Mr. Aldwinckle put at £450 per bed, but which, he thought, was an exceedingly modest estimate. Mr. Aldwinckle explained that the large cost of those hospitals was due in a measure to the amount of cubic space that was found necessary, and the enormous staff. Undoubtedly, an efficient staff, however expensive it might be, was a very important matter in a hospital; and certainly the cubic space, or, rather, he would say the distance apart of bed from bed, was all-important in hospital arrangements. But there were a good many things which it would be well to pay attention to in the large hospitals with a view to reducing the cost. Many years ago he (the speaker) had strongly advocated the omission of corridors and connecting covered-ways, at a time when Mr. Aldwinckle seemed to consider them necessary; at any rate he had provided them in the two big hospitals he had built. He was glad to see that Mr. Aldwinckle had changed his views, and now advocated in his Paper the omission of the corridors. For his own part, he should like to see them omitted altogether; he believed them to be not only unnecessary, but extremely undesirable. If they were omitted at

the outset, and were found afterwards to be indispensable, they could easily be added, and he strongly urged that their erection should at least be postponed. Over and over again they saw that hospitals, even large hospitals, could be successfully carried on and administered without those corridors; therefore he did not see why an expense of several thousands should be incurred in providing them. Another item he should like to see saved, though he feared many would differ from him, was the staff laundry. The provision of a separate set of laundry offices for the staff of a big hospital was, in his opinion—and he was supported by several others whose opinion was entitled to some weight—unnecessary, even if it were desirable; it increased greatly the difficulty of management, and it was certainly a great expense. Mr. Aldwinckle had described what he considered an essential feature in a laundry—that there should be steeping tanks arranged like a tanyard, with tanks in duplicate for each of the five or six diseases, and each tank to be separately warmed and separately drained, and so on. That was a refinement which he considered wholly unnecessary, and certainly it added very materially to the cost. Mr. Aldwinckle, again, recommended a bathroom in the disinfecting-room in order that the man employed in disinfecting the linen and clothing should have his bath. Surely he might go to the general bathroom in the male staff block. Then there was the porter's lodge, which was a little cottage containing two or three bedrooms, a bathroom, and a w.c. upstairs. Surely that was far more accommodation than was wanted for the gate porter of a fever hospital! In the first place, they did not want a man with a family, and if he must be a married man one bedroom was not only enough, but far better than two or three; if he had more, he would probably take in a relative, or possibly let lodgings. For his part he would have the gate porter's lodge simply one room—not a bedroom—and an office, and let the gate porter when not on duty go into the male staff quarters. Again, on the question of economy, he thought it altogether unnecessary to provide one w.c. for every one-bed isolation ward. That ward was in the nature of a private bedroom, and he was quite sure that the expense of providing a w.c. to each such ward ought not to be incurred—at all events, not in all of them; if it were desired to provide the w.c. in one or two of them, well and good; but where they had a dozen such rooms, he was sure it was an unnecessary expense. With regard to the size of the nurses' rooms, 13 feet by 8 feet 6 inches had been suggested, and Mr. Aldwinckle, he thought, was building them 12 feet by 8 feet 6 inches. If they had 190 of those rooms, it added considerably to the cost of the building containing them. Then, when the nurses were ill with an infectious fever, it was said they must not be put in the same wards as the general patients, but must occupy the isolation wards. He thought, however, the general wards ought to be good enough for everybody not requiring separation for medical reasons. In conclusion, he should like to be allowed to propose a vote of thanks to Mr. Aldwinckle for his most interesting Paper, which would be in the records of the Institute a most valuable document, and also for the excellent diagrams he had prepared, illustrated by the lantern.

Dr. McCOMBIE, Medical Superintendent of the South-Eastern Hospital, said he had listened with the greatest pleasure to Mr. Aldwinckle's Paper, which contained a vast amount of reliable information and suggestions of the highest value. One point that struck him as worthy of notice was the striking condemnation he showered upon the covered-way. The covered-way, he was sure, was an inoffensive thing; he knew many who objected to it, but he had never heard anyone who lived inside a fever hospital object to it; it was only those who lived outside, and who were unacquainted with the practical working of the institution, who objected to it. It was all very well to save a couple of thousand pounds over it, and let the officers of the institution straggle about in the cold and wet from one ward to another. He had tried both systems, and he had no hesitation in saying that, for the comfort and convenience of nurses and other officers, the covered-way was a very great advantage; he had never heard a valid objection to it, and sincerely hoped that the Asylums Board would not in any way interfere with the covered-ways which were proposed to connect the wards of the new hospitals. He was glad to see that Mr. Aldwinckle had paid such attention to steeping tanks. He thought they were very important things. The soiled linen that had to be removed from the patients ought certainly to be placed in the tanks; and for his part he had found these most useful, not only for the comfort of the laundry people, whose health had to be studied, but also for the health of the patients afterwards. He was glad to see that he had recommended a separate laundry for the staff. It was all-important that the infected linen of patients should be dealt with by itself, and not where the officers' linen was washed. The officers of a fever hospital went out, and, mingling as they did with the outside public and with their friends, if their linen were to be washed in the same laundry and same washhouse, and dressed with the same mangle as the patients' linen, there would be an outburst of indignation all over London. With regard to the terrazzo floor Mr. Aldwinckle had mentioned, he thought that might be the solution of one of the drawbacks of the wards of fever hospitals, where the floors must be kept scrupulously clean. If the floors were of deal they had to be scrubbed frequently, and if of

oak or teak to be polished, and a vast amount of work was involved, and he was afraid they were never as clean as they ought to be. If terrazzo could be proved not to be a dangerous floor for children, and if it could be properly warmed, he thought it well worthy of a trial in an infectious hospital. Of course, so far as the administration was concerned, they could be kept more easily clean than wood floors, and with much less expenditure. With regard to the gate porter's lodge, Mr. Gordon Smith had said that it ought to consist of one room instead of two or three, and that the gate porter when off duty should go to the common place of the men. Now, the gate in any hospital, especially a large hospital, was a very important part of the institution: it was through the gate that abuses crept in; and if the gate porter mingled and made himself familiar with the other subordinate male officers, he at once lost that control which it was necessary for the man at the gate to have; and he could not but think that in every hospital the gate porter should be a married man, and should have a house to himself.

DR. GOODALL, Medical Superintendent of the Eastern Fever Hospital, said he had listened with the greatest pleasure to Mr. Aldwinckle's Paper, and had gleaned a great deal of information from it. One or two points suggested in the Paper occurred to him as being unnecessary in a hospital. For one thing he could see no reason for having two entrances. The idea was, he supposed, that anybody coming to the hospital on business, such as delivering goods and so on, might possibly come in contact with a patient; but then no patient in an infectious state came in at the gate except in an ambulance; and surely there was no necessity to have two gates, one for the ambulance and one for others. He was very much surprised to hear Mr. Aldwinckle say that there should not be any covered-ways at all. He could quite endorse every word that Dr. McCombie had said on that point. The weather lately had been very severe; but in ordinary weather it was quite bad enough to have to go from the medical officer's or nurses' apartments into the open air. The pathways to the different wards might be covered with snow at night; one might be called up to a case in a hurry, and put on a pair of slippers, one's boots not being handy, and run off to the ward. Imagine what that was like in the snow! Besides, where was the objection to covered-ways connecting groups of wards or blocks in which the same disease was being dealt with? There could be no harm. Possibly there might be some objection to covered-ways connecting two different blocks where different diseases were being dealt with, but he had really never heard any valid objection to it—in fact, during last year he persuaded the committee of his hospital to convert a way that was not covered between the blocks of the hospital into a covered-way, and that had been a great advantage to them the past few weeks.

MR. EDWIN T. HALL [*F.*] had the very greatest pleasure in seconding the Vote of Thanks. He wished, instead of his speaking, that they had had the opportunity of hearing the opinion of other doctors besides the two gentlemen who had risen. There were a few points which had only been partially dealt with about which he should like to speak. He should like to know from Mr. Aldwinckle why he thought a hospital of 200 beds was preferable to one of larger size; because he would venture to remind him of another part of the Paper where he said that it was the administrative buildings of the hospital which so largely added to its cost; they must have a certain number of administrative buildings, and although they would of course be smaller for small hospitals, yet relatively their cost would be greater for 200 than for 500 beds. Therefore he should think that on the ground of economy it would be more desirable to have a larger hospital—within limits, of course. But, again, he believed that the managers of the Asylums Board had found that a very useful unit, from the administrative point of view, was to deal with a population of 50,000 people; and, taking Mr. Aldwinckle's standard of one bed per thousand of population, it would follow that, administratively, their experience had led them to think that a hospital of about 500 beds was the most economical, taking it all round, the best to work from an administrative point of view—and consequently the most economical. That, probably, was one of the grounds upon which they had come to the decision to make their new hospital for about 500 beds; but he believed they had never laid down any actual limit of 500; in some cases and in some sites it might be desirable that it should be 450, and in other sites and upon other planning it might be desirable to make it 550. As to two entrances, he could not see what difference it could make whether they had one or two. Why there should be one labelled, "This is infectious," and one labelled, "This is not infectious," he could not see; because whether they passed within five feet or within fifteen feet of an ambulance could make no difference whatever. With regard to the porter's lodge, he thought the doctors had answered the objections as to size. He believed the theory of the managers of the Asylums Board was that which Dr. McCombie had mentioned, that the gate porter should be a man superior in class altogether to the ordinary man-servant of the hospital, and that he should have home comforts, so that he might be kept to his own home, and not mix up with the male staff. For that reason they suggested that he should not only have a bedroom himself, but should have one or two for grown-up children, so that he might enjoy the comforts of home. Mr. Gordon Smith suggested that it was

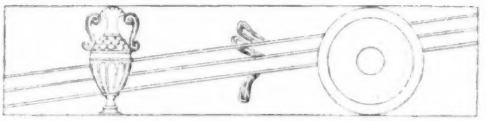
extravagant to give him a bathroom. They must remember there was scarcely a £20 house in the suburbs that had not now its own bathroom, and, that being so, the managers' view was that the gate keeper should have a house equal to any house that he might pay £20 for in the suburbs. Then as to corridors. They could not ignore the fact that covered corridors to hospitals had been done away with abroad, and there were hospitals in England where they had been done away with; but their neighbours abroad lacked that consideration for their dependents that they in England had. Irrespective of doctors and nurses, there were the servants to be considered; and when it was considered that in a big hospital there were 190 or 200 nurses alone, and something like 120 servants, the question had been discussed whether they should not be protected—at all events in the way that the doctors said they ought to be. The managers of the Asylums Board took the view that there should be these covered-ways—that it was necessary for the comfort of their staff—and where the hospitals existed without them, if they asked the staff themselves and the doctors, there was but one opinion, and that was in favour of the covered-way. Mr. Aldwinckle had showed them the arrangement of sanitary appliances abroad which no one in England would tolerate. They had even seen water-closets between the single-bed wards and the main wards, and opening directly into corridors through which all the patients and the staff and all the meals went. Mr. Aldwinckle appeared to suggest that hot-water pipes should pass round the wards. He himself thought that such an arrangement was very objectionable indeed; they were simply lodgments for dust. It seemed to him that it would be much more satisfactory to put the heat where they wanted it, to check radiation from the windows; and if instead of hot pipes along the walls they put coils underneath the windows, and warmed the air through them, and sent up a current of hot air which neutralised the cold air from the windows, they would get a much better result. The covering of walls, again, was a matter of great consideration. Cement was used generally, and recommended by Mr. Aldwinckle. He (the speaker) had been trying to bring out something different; he had, in fact, patented a new covering by means of which he hoped to cover all his ward walls with large sheets of coloured glass; a material absolutely impervious to disease germs, and a permanent decoration. Mr. Gordon Smith spoke of hospitals being built at a cost of £500 a bed. He hoped sincerely they were not going to cost that. He thought that the highest cost so far had been £400 a bed, and he hoped they were not going to exceed that. He agreed with Mr. Gordon Smith that it was quite unnecessary to have one water-closet to each single-bed ward. If the case were so serious and acute that a person had to be put in a single-bed ward, he would probably be too sick to use the water-closet, and all that was necessary was that the nurse should have access to a water-closet close by, as bed-pans would almost always have to be used. With regard to an infirmary for nurses, in the Park Hospital the managers had decided to abolish the infirmary for nurses; and he thought it was abolished in all the three hospitals. They must remember that there was a great deal of sentiment about it: it was said that the nurse lost the necessary caste and control if she were treated by the side of patients whom she was usually nursing. The compromise arrived at in the Park Hospital had been to put a separate bedroom close to the main ward; the sick nurse could there be separately nursed, and yet be under the care of the nurse in charge of the big ward. The last point was that of a separate laundry for the staff. The doctors had dealt with that, and he could only say that the managers' views had up to the present been in accordance with theirs. Whether or not the fact that the infirmary had been given up would cause them to give up the staff laundry he could not tell. Mr. Gordon Smith had spoken strongly against it, but the doctors were strongly in favour of it.

DR. DOWNES, Medical Inspector to the Local Government Board, said he had listened with great appreciation and interest to Mr. Aldwinckle's valuable Paper, and, although some of the points in it were not altogether new to him, he was bound to say that he had heard a good deal that had been instructive. One of the first and most important points was as to the size of the hospitals. He did not think that was an architectural question altogether. Everybody would admit that the larger the hospital, the greater the economy of its construction and administration. But that was not all; they had to consider the efficiency of that administration; and he thought that the Asylums Board had gone quite far enough in their concession to economy when they took 500 as a figure on their Instructions to Architects, to which reference had been made. He hoped they would resist, as far as possible, the pressure which was sure to come upon them to increase the accommodation beyond that limit of 500. He did not think that any medical superintendent could give the individual attention, which was so necessary and important, if his hospital for acute cases, as most of those hospitals were designed to be, were to exceed that figure. With regard to the question of the number of beds per acre, Mr. Aldwinckle quoted some figures; but that was a very fallacious basis to go upon, because a good deal must depend upon how the buildings were distributed. They might have 100 acres, but might crowd their hospital into one corner of the 100 acres, and have all the defects of overcrowding on that side. He would rather see laid down (as the

Metropolitan Asylums Board had done in their Instructions) some definite minimum limit of distance and size between the constituent blocks of hospitals as being the governing principle that should be looked to. As to points of structure, he would speak with great deference in that room. One great principle, he thought, should always be looked at, and that was to enclose as little as possible. With a perfect climate they would be better without walls at all; patients would be in the open air, where they would probably be under the most favourable conditions for recovery; but such a perfect climate England could scarcely be said to possess, and therefore they must have walls to the hospital; but he begged them to think twice always of every enclosure which they made—every cupboard which was enclosed, every recess, every dark corner. The less enclosures, the better, from a medical point of view. Coming to the vexed question of corridors, he had observed that if he went to a hospital where they had corridors they told him that they could not do without them; and if he went to a hospital where they had not corridors, they told him that they did not want them; therefore he was at a loss to know where the truth lay. He supposed it lay somewhere between the two—they were not wanted very seriously. He could quite understand the pressure put upon the superintendent by his staff to have all the communications between the different blocks made as comfortable as possible; but he was not sure that comfort was always conducive to health; he was not sure that a closed corridor was always the most healthy for the staff. When he had charge of a large general hospital they had no corridors, because they were all in one block; but the staff were never very healthy! Of course there was the question of cost: corridors were costly, and every economy, although it might be a small one, must be considered. It was not so much the germs in walking down those corridors that he should be afraid of, but it was the increased enclosures—the increased facilities for accumulation of dust and dirt, and dark nooks. He was surprised to hear Dr. Goodall advocating corridors; for only the other day he was looking at the gloom of his central corridor and wondering how far he could see up it. There was all that to be considered. And, then, although one sympathised with a superintendent who was called up at night, he knew what it was years ago when he had parish practice: he had no corridors to protect him when visiting his patients, but he put on a waterproof or an overcoat, and he did not think his health suffered. He was sure that many medical men would give them the same experience. Another vexed question was the porter—whether the porter should be a family man. He was quite prepared that he should be, but he thought Mr. Hall had proved too much when he said that the porter should be a family man, and should keep aloof from every man on the staff of the hospital. If he were not to mingle with the staff, why not let him be a non-resident officer? There was no risk of infection. They had a day porter and a night porter, and he agreed with Mr. Gordon Smith that the porter's lodge should be more of the nature of an office than of a residence. The width of the ward, Mr. Aldwinckle had pleaded, should be an increased width. He was somewhat conversant with the circumstances under which the width of 26 feet was adopted by the Asylums Board, and it was then urged, even with that increase of 26 feet, as compared with 24 feet, that the greater the increase of width of ward, the greater the difficulty of ventilation; and he thought that should always be borne in mind in hospitals; and, although he pleaded for the width of 26 feet, and was not sorry that 26 feet was settled, he should be sorry to see any greater width. It would increase the cost; and if the size of wards were to be increased, he would rather have greater lineal bed-space than the cross-section of the wards increased.

MR. T. W. ALDWINCKLE [*F.*] said that he naturally went into the question of large hospitals rather than small ones because the small hospitals were so admirably provided for by the plans issued by the Local Government Board, and, as the architects designing small hospitals generally copied those plans, it was scarcely necessary for him to enlarge upon that subject. With reference to what he was inclined to consider the important question of two entrances, he did not quite agree with Mr. Hall. In his opinion there was a distinct and definite reason why they should arrange that outsiders who had business in the hospital, not necessarily connected with the infectious part, should have the choice of an entrance which should take them without question into the non-infected part, and that they should therefore have no occasion whatever to come in contact with the infected part of the hospital. It was not a question of cost; it was only a question of a pair of gates. It could not be objected to on that ground, and surely that small amount of isolation, even if it were small, at a trifling cost was better than nothing; it was a step in the right direction. So far as cost was concerned, Mr. Gordon Smith and a good many other people thought—and he himself thought—that the hospitals cost a great deal of money; but it was of no use pointing out that the Asylums Board were spending more money than other people, when at Glasgow they were about to build a hospital that would cost just as much as the London hospitals. The isolation hospital at Leamington cost £385 a bed—that was, he thought, for 20 beds—and there was a small hospital for 50 or 60 at Willesden that cost £380 per bed; so that the hospitals of the Asylums Board of London were not such marvels of extravagance, but they compared very favourably with those in the

provinces. And that also had some bearing upon what Mr. Hall had said with regard to large hospitals; he seemed to imply that large hospitals would be cheaper than small ones. He (the speaker) did not think they were, as he thought they would find by actual facts. They must compare things similar with each other; they must compare good hospitals in London with good hospitals in the provinces; and he did not think they would find there was much difference. Some eighteen months or two years ago, when he brought in an estimate of something like £440 a bed for a hospital, the Asylums Board were very much astonished, and so were the rest of London at the time; but the Asylums Board made careful inquiries throughout the country and obtained a good deal of valuable statistical information; and, after carefully analysing it, they found that a good deal was done in the provinces that cost nearly as much, and that the Board were not to be considered as extravagant. As regards the covered-ways, he had become a convert for the simple reason that he had visited hospitals, not only on the Continent, but numerous hospitals in England; and he was justified, he thought, in saying that, so far as modern isolation hospitals were concerned in England, covered-ways were the exception rather than the rule. For instance, the climate of London was not more severe than the climate of Glasgow, and yet the Belvidere Isolation Hospital in Glasgow had no covered-ways, and they told him there they did not want any, and, what was more, they were perfectly happy and contented as they were. So far as steeping tanks were concerned, he had acted upon the advice and information of Dr. McCombie, and had already constructed steeping tanks upon that principle at the new laundry of the South-Eastern Fever Hospital, and it was a matter more of medical experience than anything else. Dr. McCombie had told him that they were very satisfactory—it was what he wanted and what he had got. He was surprised to hear Mr. Gordon Smith object to a water-closet for each isolation ward. An isolation ward was a ward for isolation, and not to be mixed up with any other ward; and it was immaterial whether it was for one bed or for four beds. If the value of a ward as an isolation ward was to be maintained, it should certainly have its own water-closet. Mr. Hall appeared to be under the apprehension that he had been advocating hot-water pipes round the wards. In his remarks Mr. Hall exactly described what he (the speaker) wished, viz. inlets of fresh air warmed in proper appliances coming in under the windows. He was sorry Dr. Downes had arrived at finality in regard to the limit of width of wards; he should have liked him to have kept an open mind a little longer, so that they might possibly have done a little better; but he admitted that one argument that he used was greatly against increased width, and that was that it seriously increased the expense.



9, Conduit Street, London, W., *28th Feb.* 1895.

CHRONICLE.

The late Ewan Christian.

Ewan Christian died at his residence at Hampstead on the 21st inst. At the funeral, which took place at Hampstead Cemetery on the 25th, a large assemblage of mourners testified their respect for his memory, the Institute being represented by the President, the ex-President, Mr. Brooks, Mr. Alex. Graham, Mr. Aston Webb, Mr. Ingelow, and others.

Mr. Macvicar Anderson writes: But one feeling—a feeling of unaffected sorrow—pervaded the profession on learning of the death of Ewan Christian—a name which for very many years has been universally regarded as the synonym of all that is high-minded and straightforward, not only by architects, but by the outside world. As architect to the Ecclesiastical Commissioners his place will indeed be difficult to fill. All who came in contact with him in this relationship can testify to the rare ability and conscientious devotion with which he unremittingly discharged his duties. Not a few architects will sadly miss the kindly courtesy with which he was wont to offer suggestions, that never failed to be of practical value and to educe grateful acknowledgment. In the exercise of private practice the confidence and esteem he inspired were such as can only be created by the man of integrity and the architect of ability. With him age was accompanied not so much by weakness as by undaunted energy. In harness almost to the last, with but a few days of illness, who could have wished for a more merciful or a more appropriate close to a prolonged life of exceptionally earnest work? Simple-minded, true, and kind of heart, self-reliant, generous, full of enthusiasm such as is rarely to be found unaccompanied by youth, of wide experience and extensive knowledge, the veteran of whom we were proud, and whom we all regarded with real affection, has passed to his rest, leaving to the profession and to many besides the heritage of a noble example, none the less valued because tinged, as for the time it must be, by the deep feelings of regret and sorrow which all experience who survive him.

The Ninth General Meeting.

Among the unusually large number of visitors present at Monday's meeting were several members of the Metropolitan Asylums Board, including Mr. Acworth, Mr. Hensley, Mr. Boden, Mr. Crockford, Lieut.-Col. Myers, Mr. Brass, and Mr. Duncombe Mann. Sir E. H. Galsworthy and Sir Douglas Galton wrote expressing their appreciation of Mr. Aldwinckle's Paper, and regretting that their state of health would not allow them to be present.

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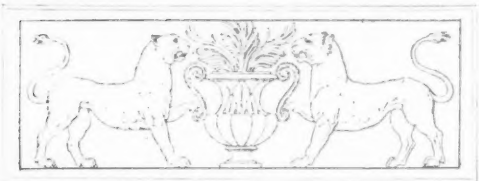

MINUTES. IX.

At the Ninth General Meeting (Ordinary) of the Session, held on Monday, 25th February 1895, at 8 p.m., Mr. F. C. Penrose, F.R.S., *President*, in the Chair, with 17 Fellows (including 5 members of the Council), 27 Associates, and 28 visitors, the Minutes of the Meeting held 11th February 1895 [p. 258] were taken as read and signed as correct.

The decease was announced of the following Fellows, viz.:—Arthur Lett, Thomas Edward Bridgen (Manchester), and Ewan Christian, *President* 1884-86, *Royal Gold Medallist* 1887. In reference to the latter, on the motion of the President, it was

> RESOLVED, that a vote of sympathy and condolence with the widow and family of Mr. Christian in the loss they have sustained by his death be entered on the Minutes of the Meeting and communicated to them.

The following Associate, attending for the first time since his election, was formally admitted, and signed the Register—namely, Robert Alexander Reid.

A Paper by Mr. Thomas W. Aldwinckle [*F.*], entitled FEVER HOSPITALS, was read by the author, and, having been discussed, a Vote of Thanks was passed to him by acclamation, and the Meeting terminated at 10.15 p.m.

PROCEEDINGS OF ALLIED SOCIETIES.

MANCHESTER.

Combined Warming and Ventilation of Public Buildings. By J. D. Sutcliffe.

Read before the Manchester Society of Architects 5th February 1895.

Introduction.—The necessity of ventilation is universally acknowledged, but many people seem to think that a room is only ventilated when a draught can be felt. If it is really comfortable, the first person that comes in—probably with a heavy coat on, and after walking hard—says, "How close the room is! Can't we have a little "air?" and proceeds right away to throw open a window. To say that to ventilate is to supply fresh air is only half a statement; not only should fresh air be supplied, but foul air should be extracted or forced out. The fresh air must also be pure, and of suitable moisture and temperature. The methods to produce ventilation may all be classed under three heads—namely, Natural, Mechanical, and by Aspiration. Natural ventilation depends upon the difference of temperature and the force of the wind. I need only remark that such ventilation will be as variable as the wind itself to throw it "out of court," notwithstanding all that may be said in those curiosities of advertising that have lately been deluging architects.

Mechanical ventilation is produced by the action of fans creating an air movement, regular and unvaried, in stated volumes, removing the foul air as fast as it is vitiated, and forcing in fresh pure air to take its place.

By Aspiration is meant the extraction of foul air by heated shafts or chimneys. In the absence of mechanical means, this is to be preferred to natural ventilation. It is now recognised that warming and ventilating are twins, or, rather, a married couple, who should never be separated. But few persons seem to understand exactly how the air in a room is warmed. It is generally thought the air in immediate contact with the burning fuel is warmed, and that this air warms more air, and so on until all the air in the room is heated. That is not so. In the case of an open fire the rays of heat dart in straight lines through the air until some solid object (such as floor, wall, or ceiling) is reached. This object quickly absorbs the heat, and slowly gives it up again to the surrounding air. The walls and furniture of a room are generally 8 to 10 degrees Fahr. higher in temperature than the air surrounding them.

The open fireplace is certainly a cheerful thing, and serves well if the room be supplied with a sufficient volume of fresh warm air from a register. Otherwise the fire will draw cold air into the room through every crevice and opening, causing intolerable draughts, especially along the floor, for the simple reason that the entering cold air falls and spreads along the floor, and the occupants suffer from cold feet. We see, therefore, that only a small part of the air in the room is warmed when an open fireplace is used. The heat is mostly spent on the air that goes up the chimney. Comfort will depend upon one's nearness to the fire.

Warming by Direct and Indirect Radiation.—There seems also some confusion as to the meaning of direct and of indirect radiation. This confusion is worse confounded by the use of the term "direct-indirect radiation," which is used by some American engineers for a combination of the two. A room is warmed by direct radiation when the air within is brought into contact with a hot surface, but not connected with the ventilation of the room—a feature which lays the system open to the very serious objection that the same air is warmed and inhaled over and over again. Warmth may be secured, but it is at the expense of health. The ordinary stove is an example of direct radiation, and so are steam and hot-water radiators as generally made use of. A room is said to be warmed by indirect radiation when outside air is passed over a heated surface before entering the room. This system, being necessarily connected with ventilation, is making rapid progress in public and industrial buildings.

Three Systems of Central Heating.—There are three different systems (speaking broadly) of central heating—namely, steam, hot water, and warm air. All cannot be alike successful, and the question is, what are the merits of each? The three systems have a single fire as their only feature in common. When steam is to be the heating medium, a boiler is placed in the basement of the building, and connected by steam piping to coils in a heating chamber or in the main air-ducts, supplemented possibly by radiators fixed in the rooms. Practically the same arrangement is employed for hot-water as for steam heating; the wrought-iron pipes are filled with hot water in place of steam, but the system of radiation remains the same. The antiquated hot-air furnace, with its limited surface made red-hot, which burnt all the air brought into contact with it, need not concern us. It is as dead as the proverbial door-nail. The modern air-warmer has abundant surfaces of tubes or gills exposed to the air as it enters fresh from the outside continually, and the heat of the fire, diffused as it is throughout the whole of the exposed surface, cannot make any of it intensely hot. It will therefore be seen that the air-warmer accomplishes the same result as the steam or hot-water boiler, and that it is not designed for direct radiation, but must necessarily be combined with ventilation, thus securing both.

Some Reasons for adopting the Warm Air System.—The cost is about one-third less than for good steam heating. The expense of fuel is from one-third to three-fifths less. Heat may manifest itself in two ways, namely, as temperature and as expansion. All the force generated by the burning fuel will appear in one of these forms or as part of both. Water at the nominal pressure can only be heated to 212 degrees Fahr. The energy given out by the burning fuel is not lost, but is transmitted to the water in the

form of expansion, and the water is converted into steam. Now if water be confined, its temperature can be raised almost to any extent. As it is necessary to force the steam through the pipes, this expansion must be resisted until sufficient force is accumulated to accomplish that result. This mechanical work is performed at the expense of fuel. On the other hand, air may be warmed in a well-constructed air-warmer, so that nearly all the energy developed by the burning fuel appears as temperature; scarcely any of it appears as mechanical motion: hence the economy of fuel.

There is no possible danger from explosions with air-warmers, whilst with steam there is constant risk, whether the pressure be high or low. There are no water pipes to freeze or burst and let the water through the building, ruining plaster and furniture. Repairs for steam boilers, pipes, and fittings will probably cost ten times what they would with an air-warmer, and in one case they must be carried out by a skilled mechanic, and in the other any caretaker can do them. Much less time is taken to warm a building after the fire is lit. The warming is easily, and, in fact, necessarily, combined with the ventilation; a vital condition which is not so easily secured in any other way. Before proceeding to give examples and explain in detail the systems of mechanical ventilation and warming, I wish to direct your attention briefly to—

Warming and Ventilation without Mechanical Power.—The air-warmer is always fixed in the basement. The air warmed by it at once rises through the various air-ducts, provided in the walls or otherwise, up into the rooms, driving before it the air which preceded it, but now become cool and more or less vitiated. The inlet window opens directly into the fresh-air room. The air passes thence to the air-warmer, and if it is to be warmed, the damper or valve shown in the duct is dropped down. If the fresh air is not to be warmed, the valve is raised, and the air passes under the air-warmer direct to the room. This valve is regulated from the room, and you will readily understand that any desired temperature may be obtained, but the air cannot be shut out.

I may mention two buildings warmed and ventilated on this system. One is the Friends' Meeting House, Birkenhead, designed by Messrs. Grayson & Ould, Architects, Liverpool, and the other is the Friends' Meeting House, Scarborough, designed by Messrs. Malcolm Stark & Rowntree, Architects, Glasgow. The buildings are about the same size, and a description of the warming and ventilating of one is practically a description of the other: the air enters the fresh-air room on its way to the air-warmer, and thence up the vertical ducts to the rooms above. The vitiated or cooled air is expelled or exhausted at the floor level, and passes under the floor to the exhaust ventilating shaft. This exhaust shaft has a small heater fixed at its base to accelerate the ventilation in summer. In winter the heat of the smoke flue is quite sufficient for the purpose.

There are limits to the successful warming and ventilating of buildings by the method I have described. In large towns the air is not sufficiently clear and pure to enable us to dispense with screens or filters. These offer so much resistance to the entering air that a fan is necessary. Then, again, where there are any horizontal air-ducts of considerable length, partial failure would result, as the air would not travel along those ducts with effect. For successful warming and ventilation without mechanical power the building should be compact, and in an open space where fresh, clean, and pure air can be obtained without filtration. Further, the rooms in the building should be small in size—say not more than 50 or 60 feet square—and should be so arranged that vertical or nearly vertical air-shafts could communicate direct from the warm-air chamber to each room.

Mechanical Ventilation.—With fans all difficulties of (I had almost said time and space)—all difficulties of filtration of air, direction of air-currents, and size of air-ducts and buildings are removed, and we get the air absolutely under control. It is not surprising that in the earliest attempts and the oldest practice of anything like positive ventilation the course taken was to exhaust from the building. The advantages of the exhaust system can be seen at their best in factories and workshops, where the object is generally the removal of heat, dust, steam, or some other floating nuisance, and not the ventilation of the building as a whole. The fan causes a very slight tension or rarefying of the air in the room, and therefore a constant tendency of the outside air to enter through the inlet openings, which are placed wherever most suitable for the air to traverse the space to be ventilated on its way from the inlets to the fan. On the exhaust system heating surfaces should always be provided at the inlets, which should be well distributed and of ample area, so as to reduce to a minimum all chance of cold air being drawn into the room through crevices at windows or doors.

When dealing with the complete ventilation and warming of a building, especially if its size be considerable, it is convenient, as a rule, to provide more fan power for the supplying of fresh air than for its removal after it has served its purpose. The ventilating engineer thus secures more control over the distribution of effect, and the maintaining of a "plenum," or very slight excess of pressure within the building, prevents any inrush of cold air through crevices or incidental openings. In buildings of moderate size it is generally not necessary to use additional fans for exhausting, especially if the foul air have no great horizontal distance to travel.

The question may be asked, should foul air be exhausted upwards or downwards? I maintain that it should be downwards, and for the following, besides many other reasons:—In the process of respiration fifteen cubic inches of carbonic acid gas per minute are given off from the lungs of each person. This gas in its pure state is so dense that it can be poured from one vessel into another. Carbonic acid gas is 52 per cent. heavier than air. Its tendency is therefore to sink below the level of the mouth, and occupy the lower portion of the room.

That the air has a tendency to rise as it becomes vitiated is often advanced as an argument in favour of upward ventilation; but Mr. Burney held before a Committee of the House of Commons that the downward propulsion which the breath received from the mouth and nostrils did not cease its downward course, so far as the impurities it contained are concerned, until it deposited them on to the ground.

Temple Chambers, Manchester.—The first example of a building warmed and ventilated by a mechanical system that I wish to call your attention to is Temple Chambers, Manchester. This structure is in many respects unique, and was designed by one of your Hon. Secretaries, Mr. Edward Hewitt. It contains about ninety separate offices, and is lighted throughout by electricity. There is not a fireplace in any room. The whole building is warmed from a single coke fire in the basement. The tenants see nothing of the means by which they are supplied with air warmed to a suitable temperature. The system of warming and ventilation is that known as the Blackman Single Duct system. It is one of the simplest systems known, but is not so complete, in my opinion, as the double-duct system I shall describe later on.

In the basement at one end of the building is fixed a Blackman air-warmer and a 54-inch Blackman fan. The outside air is drawn through a large canvas screen or filter on which jets of water play continuously. The whole of the air entering the building must pass through this filter, where it is washed and cleansed from impurities. The fresh air is then drawn through the air-warmer and propelled by the fan along a main air-duct fixed under the ceiling of the basement. This duct runs the whole length

of the building, and from it vertical air-ducts lead to every room.

The wall, or partition, on each side of the corridor is honeycombed from end to end with these fresh air-ducts, which deliver the air into each room through registers fixed about 7 feet from the floor. A register fixed in the bottom rail of each door allows the cooled or vitiated air to escape into the corridor, where it is laid hold of by a 42-inch electric Blackman (fixed at the head of the common staircase), and discharged into the open air. The temperature is under the control of the caretaker. By sending the air round the air-warmer, instead of through it, the temperature can quickly be reduced to the normal temperature outside.

Besides Temple Chambers there are several other buildings warmed and ventilated on this principle. These include, amongst others, a new school for the London School Board—Mr. Bailey, architect; the new Central Higher Grade Board School at Sheffield—Mr. Mitchell-Withers, architect; the Winsford Technical School—Messrs. Woodhouse and Willoughby, of Manchester, architects; the St. Helen's Technical School—Messrs. Briggs and Walstenholme, architects, Blackburn; and the Street Board School, Somerset—Mr. W. Reynolds, architect. The Street School Board, one of the smallest in England, was the first to adopt this system. The latest completed building is the John Street Board School, Pendleton, for the Salford School Board. This school has only been opened a week or so, but I made some tests before it was occupied, and found a fairly even temperature throughout the school of 58 degrees when the temperature outside was below freezing-point. The ventilating and warming apparatus was got to work as soon as the windows were in, and consequently floors, wall, and ceilings were dry on the opening day, and in a very different state for occupation from the usual new school. This school was designed by Mr. Henry Lord, and is the first school in the Manchester and Salford district to use a combined scheme of mechanical ventilation and warming. Let us hope Manchester will not remain long behind Salford in this respect!

Of course there are limits to all central heating. It is not well to transport warm air further than about 120 feet from the source of its warmth, or its temperature will fall too much by absorption in transit. If warm air be the heating medium, greater distances require more than one air-warmer suitably placed; and if steam or hot water, then auxiliary heating surface is fixed, generally in the main air-ducts.

In order to give an occupier independent control over the temperature of his own room, what is known as the Blackman Double Duct system is employed. Each main air-supply duct is made double, the passage for warm air being placed over that for cold air, and the branch ducts are so arranged that they can be connected instantly with either supply at pleasure.

The new Technical School, Salford (also designed by Mr. Lord), is warmed and ventilated on this system, and I shall have pleasure in pointing out its special features as detailed in the plans before you. This arrangement is necessarily more costly than the single-duct system as at Temple Chambers, but it has the advantage of allowing the teacher or occupier of any room to have the temperature he likes best. I know several authorities who claim that the teacher or occupier is no judge, and that the more scientific plan is to decide what temperature is best, and instruct the caretaker to see that this temperature is maintained in all the rooms. This is very well in theory, but it does not work out so well in practice. I happen to know the little lean man who wants his room at 70 degrees—nothing less will do for him. I also happen to know his stout neighbour who occupies the very next room, and he thinks 55 degrees is warm enough for any sensible man. At Salford both these men can be accommodated.

The ventilation has been arranged so that the student will have a minimum supply of 3,000 cubic feet of fresh air per hour, and the air will be changed from four times an hour in the drawing and similar room to ten times per hour in the chemical laboratories.

Factory Warming and Ventilation.—You know the practice was, and is, to warm a factory by running steam-pipes around the room, or, if the machinery interfered, then to fix the pipes just above the heads of workpeople. This is surely dead against the hygienic maxim of warm feet and cool head. Now I am pleased to notice that it is becoming recognised as essential that if the best results are to be obtained, it is as necessary that the employees should have a plentiful supply of fresh air warmed to a suitable temperature as it is for them to have good food.

A large employer of labour told me that during the severest weather the production of his factory went down 20 per cent. He attributes it to the fact that some of the workpeople would not come into the cold factory before breakfast, and when they did arrive the cold made them so miserable that they could not possibly get through the average amount of work.

The main building of the new factory recently erected at Coventry for the Pneumatic Tyre Company is a large one, measuring, roughly, 300 feet by 60 feet, and it is three storeys high. The two air-warmers are fixed outside the main building, and a 72-inch Blackman pulls the air through the air-warmers and drives it forward along the main air-duct at the rate of two million cubic feet per hour. This air is admitted on one side of the room, and in this instance (for special reasons) it is exhausted at the other side. Five 30-inch Blackmans are fixed for exhausting, and the wooden trunks surrounding the fan show that the air can be exhausted either at the ceiling or the floor level. This was necessary, as in the process of the manufacture of pneumatic tyres some very volatile chemicals are used, and the fumes from these rise quickly to the ceiling; whilst, on the other hand, the naphtha fumes drop quickly to the floor, and positively roll in blue clouds along it to the lower exits. The air is changed throughout the factory six times an hour, and a temperature of 65 degrees Fahr. is maintained in all weathers. At this temperature the solution used for attaching the canvas to the rubber dries very quickly, and the fumes are removed as fast as they are given off.

Practical Hints.—A practical word in conclusion. There is great difficulty in getting architects to provide air-ducts, as well as inlets and outlets, of sufficient area, and unless this be done, satisfactory ventilation is impossible. Even when promised I have known architects give the preference to the scheme using the smallest air-ducts. One instance is very fresh in my mind. I was asked to prepare a scheme for a large technical school. The conditions plainly stated the number of pupils likely to occupy each room, the cubic feet of air to be supplied to each, and the maximum rate of air motion through the registers into rooms. Here, I thought, was a fair chance. Judge of my surprise when the architect told me that we had lost the contract because of the largeness of our air-ducts! He said, "In fact, the successful competitor is only using ducts "one-fourth the size of yours," and pointed out a room where I had shown an air-duct 12 inches square, but in the accepted plan the duct was only 6 inches square.

If I had not been afraid of hurting the architect's dignity I should have pointed out to him that with this difference one or two things must happen. If he were to have the same velocity passing through his 6-inch air-duct as through my 12-inch, he could only have one-fourth the volume of air; and if he were to have the same quantity of air brought in, then he would with four times the velocity have such a rush of it that an intolerable draught would be the result.

Now, you may ask, what should be the rule in estimating

the area of inlets for admission of fresh air, and the area of outlets for getting rid of the impure air? These must depend mainly upon the number of persons who will occupy the room, and not to any extent upon the size of the room. For instance, take a schoolroom occupied by fifty pupils: they each require not less than 30 feet of air per minute, or 1,500 cubic feet amongst them. The cubical contents of such a room (say 30 by 30 by 12) would be about 11,000 feet; dividing this product by 1,500 (the amount of air required per minute by the occupants of the room), we find as the quotient less than 8, which represents the number of minutes during which the air would be reasonably wholesome unrenewed. We should therefore supply, regardless of the size of the room, 15,000 cubic feet of air per minute if fifty persons occupied the room. Pupils from fifteen to twenty years of age should each be supplied with not less than 40 cubic feet of air per minute. One large firm of American ventilating engineers declared not long ago in their catalogue that it was not necessary to use exit ducts at all, and that if you only blow air enough into the room and at sufficient pressure it will find its way out again "somewhere"; and in a discussion on this subject at a meeting of the Manchester Society of Engineers one of the members supported this view, and illustrated it by saying that it was no use using two bolts where one would do. One might reply that if two are necessary it is suicidal to use only one. It must be apparent that if you do not provide exit ducts in their proper places, you cannot possibly have the fresh air passing freely through the room and taking the impurities with it.

In estimating the rate of air motion 5 feet per second, or 300 feet per minute, should be the maximum. First, then, ascertain the number of cubic feet of air to be passed through any opening, and divide it by this speed of 300 (or less), and the quotient is the maximum net clear area of the openings in square feet. To this, of course, should be added the area of the fixed bars of the grating or register to be inserted in the opening. This gives 5 square feet as the least net total of openings into or out of a room to be occupied by fifty persons.

A recent writer (Margaret McMillan) tells us how very difficult it is to get people to recognise the powers of the air. If the elements of which it is composed were only visible, and we could see the curious and original way each behaves, our conduct towards them would be very different. If we only knew each element intimately, and could shut out the injurious ones, how healthy we should all be. Take oxygen, for instance, which is the most abundant element in the earth. It is so necessary to life that the old chemist called it "vital air," and yet this royal element is "Hail fellow well met" with every other element except fluorine. It will marry the carbon you have breathed and give you a splitting headache, while the same carbon dioxide in solution makes an aërated water which relieves your headache. It will combine with sulphur to form a suffocating gas. It will join hands with alumina and become a priceless ruby. It will interlock itself with hydrogen and become a sparkling stream.

The royal element, active though it be, need never be other than our servant. Our great safeguard is to allow the royal element oxygen to enter our rooms freely. In pure air he is just sufficiently diluted with nitrogen to act quite healthfully; he then enters the lungs, sends the blood in a strong, healthy current through the veins, and only when he meets with artificial foulness does he fail in his health-bringing mission.

THE GLASGOW SCHOOL OF ART.

The series of lectures on "Mediæval Architecture" delivered by Mr. Alexander McGibbon [*A.*] for the Glasgow School of Art commenced on the 24th October 1894. By permission they were given in the Corporation Galleries, and throughout were illustrated by limelight views. These lectures were in continuation of those delivered last session by Mr. W. J. Anderson [*A.*] on "Italian Renaissance Architecture" [Vol. I. pp. 126, 156, 243, 319, 363], and form part of the Architectural Curriculum of the School [KALENDAR 1894-95, p. 169], on the Governing Body of which are Mr. T. L. Watson [*F.*], President of the Glasgow Institute of Architects, Mr. W. Leiper [*F.*], A.R.S.A., and Mr. J. J. Burnet [*A.*], A.R.S.A. The epitome given below of the entire course of eight lectures has been kindly furnished for the JOURNAL by the lecturer himself.

In the Introductory Lecture Mr. McGibbon explained that the term "Mediæval" had been chosen as covering Romanesque and Gothic, emphasising the fact that Gothic is something more than merely developed Romanesque. The opinions expressed in the recent works of Mr. Moore and M. Corroyer were considered; these largely echo Viollet-Le-Duc's definition of Gothic as the embodiment of the principle of equilibrium, thrust resisted by thrust, rather than by *vis inertiæ* of massive wall and buttress. It was shown that the definition, however true of French work, is only partially so when applied to ours, where time and again native methods have been broken in upon by new modes from Normandy, Royal France, and lastly by the Renaissance from Italy; and yet through all there has been preserved a continuity of sentiment with our earliest primitive Romanesque, while withal there seems no good reason to deny the title Go hic to even our modern work. What we lack in logical consistency has been balanced by our persistency of attachment. France at the Renaissance finally forsook Gothic, and to-day the style is not studied by her students, while with us it lives, and will live—in Greater Britain it has yet a future. Disclaiming for Mediæval architecture any position of supremacy among the world's architectural styles, particular criticism was directed to the unwished-for approval of the ecclesiologist, who finds dogma in every feature of the church building; of such as Mr. Morris, who, when last addressing the Glasgow School, tabooed the Italian Renaissance for the city's municipal chambers as a style, because associated with the lust and tyranny of its patrons; of such as Mr. Ruskin, who, in nature as expressed in field and flower, would find the prototype of Architecture as if it were a natural growth, rather than being what it is, the most artificial of arts. It was submitted that in poetry is to be seen a better analogy, where, as in the sonnet, rules the most rigid and arbitrary, of the poet's own devising, have been conformed to in the expression of emotions the most intense.

The second lecture was given on the 7th November, when Romanesque as practised in North Italy, Germany, and France, and more particularly in Normandy, was first considered. That Germany should so completely have discarded her native round-arched Gothic, or Romanesque, for the French Pointed must ever be regretted; only arrested, however, its features may yet be taken for modern development. Such information as can be had of our primitive Romanesque and pre-Conquestal Norman was summarised, and a review entered on of the work of the Anglo-Norman period between the dates 1080 and 1150. That the contemporaneous work in Aquitaine and other provinces of France should so slightly have influenced English models is remarkable. Romanesque may not equal Byzantine, which boasts that crowning architectural glory, the Dome; but just because of the necessary infrequency of that feature's employment in modern work, we may the better use Norman, for Byzantine without the dome is reduced to an architecture of decoration only. In respect, too, that in Norman practice vaulting of large span was not attempted, timber-roofing being considered quite sufficient and appropriate, we find that modern requirements have most happily been anticipated.

At the third lecture, given on the 21st November, the

work of the Transition was discussed, French examples briefly, English and Scottish more particularly. The style was commended for revival as possessing merits peculiarly its own; more elegant than the Norman, yet preserving the use of the semi-circular arch—though freely admitting the pointed—while richer in its decoration than the Early English; for its enriched arch moulds and door-jambs, even the later beautiful intricacy of moulded-profile, refined foliage, and general elegance, hardly compensate. The square abacus not only gave a beautiful type of capital, it did good service in permitting the emphasising of the Orders in an arch-mould that in succeeding periods sometimes degenerated into mere reeded planes. In describing the Northern examples it was said that of Scottish Mediæval work only its Transitional could stand comparison with English. In size and richness of its Norman, Early English, and Decorated architecture Scotland is far surpassed; but nowhere south of the Border can a finer door be found than that of Jedburgh west front. For us there seems special cause of interest in Transitional architecture as very largely the outcome of indigenous taste influencing the imported Norman. How far the assimilating process might have been carried cannot be said; the potentialities of the style were never fully tested. Even rightly to apportion the credit of the development is difficult: whether to Norman ecclesiastic or noble, influenced by the *genii loci*, or to Saxon craftsmen and native tradition reasserting itself. In any case the style, for revival, seems to promise better than when choice is made of a perfected style. The second part of the lecture was occupied with a brief account of the social economy of the cathedral, the abbey, and the parish church, so far as might explain the functions of the various architectural forms and arrangements met with in these buildings. Why the French cathedrals should lack the chapter-house that is such a distinctive feature with us is explainable by the different relationships of ecclesiastical and municipal authority in France. Of abbey and cathedral conjoined in Scotland there is but one example, St. Andrews, for Iona was only so from the fifteenth century.

The fourth lecture was given on the 5th December. The section treated of was Early Gothic in France and England during the first three-quarters of the thirteenth century. It was shown that much more than the general use of the pointed arch was implied in the new style; the resistance of thrust by thrust in the flying-buttress led to the concentration of weight on points of support rather than on walls. Other styles had largely used pillars—the Hypostylar Hall at Karnac and the Mosque of Cordova, for example—but in these styles the weight supported was directly overhead. On the Gothic principle weight could be dispersed among many supports through the flying-buttress. The broad classification, sometimes met with, of architecture into trabeated and arcuated, to take account of essential principles rather than mere appearance, should assign to the former division such arching as merely replaces the lintel. In French cathedrals the strange illogicality, noted by M. Corroyer, of buttresses of equal strength being employed to resist the unequal thrusts in a sexpartite vault is hardly more remarkable than the artistic blemish of their monotony; variety would at once be more rational and pleasing. The timber roofing over vaulting, it may be admitted, when of steep pitch, is largely to justify steep gables. The Italian examples, so often derided, of high-pitched gables that mask low roofs are no whit worse than Northern examples; where for a slate covering a much less acute rake would suffice, and for lead the rake of a Greek temple or Perpendicular church would be more reasonable. The use of principals would have permitted the rafters to have lain nearer to the groin, their feet coming well below the vault-ridge, and then small gables would consequently have resulted over each bay of the clerestory. Only in the case of open timber roofs can the steep gables be justified, for then within and without effect is gained logically. A description was then entered upon of the principal works of the period in France, and English and Scottish examples were in turn analysed. The latter show that the Early English style was employed without modification to any material degree.

The fifth lecture, given on the 19th December, dealt with Decorated Gothic, which in its general application is common to many countries besides Britain; hence our English variety is deprived of the peculiar interest that attaches to the style that came before, and that followed after it; it has neither the severity of Early English, that shares most things in common with France, but is made distinctive by the lancet, or, on the other hand, the novelty of the quite dissimilar Perpendicular that is purely national. English Decorated has perhaps hardly received a due recognition, and is judged relatively, rather than on its merits. This is in part accounted for by the fact that its period, 1275-1375, was not one of great church building; Lichfield, the smallest of English cathedrals, is the most complete example. Even if it did nothing more than, as its name implies, embellish selected features that had established themselves in popular favour—while others, such as the disengaged shafts, were discarded—the style would commend itself. The arch had the ogival variation given it, the buttress was enriched with niches, and the parapet with tracery and battlements; but beyond these mere decorations, the development of the great traceried window and the open timber roofs were real architectural achievements. The octagon of Ely would alone confer distinction on any style. In Scotland the style endured until the Renaissance; so the work there, contemporary with English Decorated, may conveniently be called of the first period; that contemporary with Perpendicular, which, curiously enough, never got so far north, may be called the second period.

The sixth lecture, delivered on the 16th January 1895, had for its subject the Design and Arrangement of the Mediæval Church. The consideration of so extensive a field of architectural effort, in a general way, is a necessary complement to the particular analyses of the various styles met with in this historic fabric. If we would realise the progress or decline of artistic and constructive skill, or trace the development of features, such as the buttress, the window, mouldings, &c., we must pass in review all the architectural modes current during the five centuries of the Mediæval period. The relative sizes of Continental cathedrals was first compared with our own, then the various types of plan favoured by the different nationalities were considered. While the English cathedral may claim to be effective with the greatest economy of means, due acknowledgment must be made of the excellence of the French apse, and of the Italian dome, as seen at Florence and Siena—these last especially, for not infrequently Northern Gothic is conceived of as in every respect surpassing Southern work. The central tower, eastern and western transepts, and the chapter-house are features distinctively characteristic of the British cathedral, and these were in turn discussed. The well-lighted gallery over the aisle, that in France takes the place of our blind storey, is the better arrangement in a building where imposing ceremonies must frequently occur. In towers, both central and western, the limit of variation is in England restricted, the German open-work spire is unknown, and the open crown is a type worked out in Scotland, if not actually there originated. After successively reviewing the window, the buttress, stalls, &c., as an instance of how all this antiquarian knowledge affected modern architects, reference was made to the Liverpool Cathedral competition, affording illustration of what, to the competitors, appeared the excellent points of the ancient

models. The parish church was next passed in review, and those arrangements dwelt on that seem most adaptable to modern requirements. Here, too, it was insisted on that precedent should not be permitted to stifle original thought; acquaintance with past methods may, however, obviate wearying groupings in design, but it is necessary that we study not merely well but wisely.

The seventh lecture was given on 31st January, when the Perpendicular style was discussed. This style had the longest life of any, and hence the numerous examples extant, though none are of the first importance in scale; their survival may largely be attributed to the fact that no subsequent style has intruded, as Perpendicular itself had, upon existing work. The artistic motive in the new style was possibly a more self-conscious one than that attending previous developments; there was a desire for a superior beauty; before, architecture had rather expressed the Church's power. Whatever the merits of the style, it was quite an indigenous growth, the first and only real English Gothic. The vigour of the national life of the period should commend to us its architecture, but instead there is prevalent an unaccountable disparagement of both. How original Perpendicular was may be realised by a comparison with French Flamboyant that appears as the natural and inevitable development of Decorated; while Perpendicular shows in many points a quite unconscious recurrence to earlier principles. Thus: the more stone-like treatment of bar tracery that was in effect plate, but with a greater depth than Norman or E.E. ever had; fan vaulting in which extremes met, for when ribs became most numerous, in reality it was the vault surface that again, as in Romanesque, was the constructive necessity; the depressed arch, that was an invention artistically only less valuable than the pointed; for if the earlier form permitted of a greater height than the semicircle, without the objectionable stilting, so the later made possible a lesser height by other means than the equally unsatisfactory segmental arch. The flat timber roof, too, was again of the pitch best suited for its lead covering, and alike internal and external appearance was expressed by the gable. Even the all-prevalent panelling may be defended as decoration of the wall proper—Mr. Ruskin's "veil"—in more architectural fashion than mere rustication, however elaborate; for it can hardly be questioned that the wall is as worthy of embellishment as the fenestration that in Renaissance was the principal field of display; while in Roman practice there was an imposition of an Order that ignored both wall and window. The lacking feature in the style was the column; previously it had been minimised to the engaged shaft, but now even that was frequently dispensed with, and archmoulds were continued to the ground. To persist in denying ourselves the use and enjoyment of this chief of architectural features is to provincialise the style, so in any revival of Perpendicular the column should certainly be reinstated; and to do this, in style, will provide scope for legitimate originality.

In the closing lecture, delivered on the 13th February, the first part was occupied with a review of late Scottish Decorated, principally of the sixteenth and first half of the succeeding century; of earlier work, the nave piers of Dunkeld Cathedral, that show the columns retained, were commended as suggestive. At the very close of the fifteenth century, in the crown towers of St. Giles and King's College Chapel, Aberdeen, appear the most distinctive feature that Scottish Gothic can boast. Her Decorated had more affinity with French Flamboyant than with English Perpendicular, and the cause that prevented the latter crossing the Border seems to have been the decline in the Church's influence, with the rise in social condition of the worker. The Church was still the chief patron of architecture, but the designer no longer followed, as matter of course, the fashion of the South. The Scoto-French political alliance of the times sufficiently accounts for the Renaissance influence seen in baronial buildings of the period; still, it is remarkable how that style should percolate down to the humblest strata of buildings, and become, in time, the vernacular expression of taste, to the complete abandonment of every trace of Gothic tradition and practice.

The review of Mediæval architecture completed, a short notice of Mediæval builders was given. The "master-"mason" was seen to be the functionary most nearly approximating to the modern architect, an office that dates from the Conquest, and one generally filled by a layman. Too often architectural credit has gone to bishop and abbot, for the title "Surveyor" and "Supervisor," frequently held by prelates, might better be expressed by the word Steward; they were cultured and munificent patrons of architecture, but only very rarely indeed actual designers. The limited variety in building and the almost constant type of church plan—further, that masonry and, later, carpentry were the crafts directed by the "master-"mason"—show that his duties were by no means so multifarious as are those of his successor. The influence of the Freemason is now regarded as much less potent, even in the latest years, than was once imagined.

Geometric proportion and numerical ratios in building, if ever generally employed—which is very doubtful—have been so on a principle whose secret is now lost. Ingenious arrangements of triangles may be applied to sections, but we are hardly convinced that their rationale is understood. Mediæval mouldings, too, can hardly be thought of as most logical elaborations of profile to best insure subtle shadow when on north and sou h frontages they appear alike. True, this applies to Classic as well; but it is only of Gothic that this contention appears of its superiority in the philosophy of mouldings.

At the conclusion of the lecture Mr. T. L. Watson [*F.*], on behalf of the Governors of the School, expressed gratification at the interest and attendance the course had attracted. Its justification, however, did not lie altogether in monetary success; architecture as an art of first importance claimed the best attention of a School of Art, and in this and the preceding course there had been given information, historical and critical, complementary to that practical acquaintance to be gained by study of actual examples in the class-rooms and by design.

THE DUNDEE INSTITUTE.

Strenuous efforts are being made by the Dundee Institute of Architecture, Science, and Art to reach members of the profession practising in the extensive district north of the Forth, of which Dundee is the recognised centre, for the purpose of enlisting their sympathies in the cause of professional union and co-operation in the work of architectural education now being energetically prosecuted by the two allied Scottish Societies located respectively at Glasgow and Dundee. A circular letter just issued by the Council of the Dundee Institute calls attention to Mr. Macvicar Anderson's Presidential Address in 1893-94, in which a description is given of the architectural provinces then recently established, and the advantages likely to accrue to the profession from the new organisation, and quotes the terms of the resolution agreed to at the Conference of Liverpool in April 1893, in which the objects of the scheme are briefly enumerated. The Dundee Council proceeds that it is in no spirit of self-aggrandisement, but in loyal adherence to the Royal Institute in its desire to carry out the objects therein set forth, that it asks the cordial assistance of every practitioner, student, and lover of architecture, science, and art in the northern part of Scotland to join its ranks and assist in the consolidation and elevation of the architectural, artistic, and scientific professions, in the organisation and extension of classes and other means of instruction for the more efficient education of pupils and students in these professions.

The Council is fully alive to the fact that Aberdeen, with the northern counties, has within its borders a sufficiently large number of architects to form a Society of its own in alliance with the Royal Institute, and that it also has educational institutions of a very high order; but until such a Society is formed it would appear to be desirable that the existing local central body should embrace within its ranks those whose pupils may come up for examination, and also by the co-operation and consultation of its brethren in the northern counties to knit together more closely the architects, scientists, and artists of the northern part of Scotland.

In connection with the educational work of the Dundee Institute, a special section is to be opened, and special prizes awarded for competitive work submitted by persons resident beyond the Dundee district.

LEGAL.

Timber Structure, Temporary or Permanent [p. 263].

THE LONDON COUNTY COUNCIL *v.* GLICKSTEIN.

Mr. Henry Lovegrove [*A.*] writes:—Referring to the case, *The London County Council* v. *Glickstein*, reported on page 263, I should like to state that I discovered this building in course of erection in a remote part of my district, and went directly to the police court and obtained a summons against Mr. Glickstein, who, the foreman stated, was acting as his own builder. The same magistrate who tried the second case decided that I had not proved that Glickstein was the builder, although I produced a witness who had written down what the foreman told me. A son of the defendant swore that the foreman (Smith) was the actual builder, but it seems hardly likely that a timber merchant would employ a builder to erect a wooden building. The foreman Smith has disappeared, and cannot be found. The result is unfortunate, as there is in existence a large wooden building which, in the event of a fire, would do much mischief.

Under the 1894 Act the owner can be proceeded against.

Architects' Charges.

HILL *v.* KAPHAN.

On the 11th February, in the Southampton County Court, William Burrough Hill, surveyor, of Southampton, sought to recover from Joseph Kaphan, of Southampton, the sum of £22. 2*s*., made up as follows:—To receiving (in September) instructions, taking measurements and memoranda, preparing plans, elevations, and specifications for rebuilding, and submitting same to the defendant, £20; to preparing set of tracings and plans, and forwarding same with application to the Urban Sanitary Authority, £2. 2*s*.

Mr. C. Lamport appeared for the plaintiff, and Mr. A. H. Emanuel for the defendant.

It was stated by Mr. Lamport that the amount claimed consisted of the usual architect's charges for work done on the instruction of the defendant. At the time the defendant was under an obligation to carry out the repairs to the building in St. Mary's Street, and lay out a sum of about £800 on the premises. The plans were prepared and sent to the Urban Sanitary Authority, but they were returned to be amended in some slight particulars. The plaintiff wrote to the defendant reporting the result of the submission of plans, and asked him to call so that alterations could be carried out; but Mr. Kaphan, instead of going near the plaintiff, had other repairs of a different character, having purchased the freehold in the meanwhile. The defendant had declined to pay these usual charges.

Plaintiff gave evidence in support of his case, bearing out the statement made by Mr. Lamport, stating in reply to Mr. Emanuel that he was trying to do his best for the defendant in the plans, and the Council sometimes made concessions. He could very easily alter the plans to meet the requirements of the by-laws, and would have done so free of cost.

Mr. Wheeler, architect and surveyor, having charge of that department for Mr. W. B. Hill, stated that the charges made were reasonable. He admitted that by the alterations of the plans two rooms would be cut off, but they could easily be put somewhere else.—Mr. Mitchell, jun., a member of the firm of Messrs. Mitchell, Son, & Gutteridge, gave evidence as to the fairness of the charges made.—Replying to the judge, Mr. Lamport contended that an architect would not lose his fees because the authorities did not sanction the plans, and especially was this the case when the architect was prepared to rectify the plans.

Mr. Emanuel, for the defence, urged that it was a novel situation for a surveyor to say he had made a mistake in his plans; that he had prepared plans which were useless, upon which the borough authorities would not allow him to proceed; and that he should write to the defendant asking him to come and show him what he was to put right. It was the duty of the plaintiff to send plans which could have been acted upon. He also contended that this was a contract to do the plans and carry out the work for 5 per cent.; it must be taken as a whole, and was not divisible.

William Henry Killick, assistant borough surveyor, spoke to the plans prepared not being in accordance with the by-laws, and if anyone persisted in building upon these plans there would be a summons issued, and an order could be got to pull it down.

His Honour nonsuited the plaintiff without prejudice to an action in the future if the defendant ignored the plaintiff in his carrying out the building.—Mr. Emanuel assured his Honour that the defendant intended to build, but was waiting for the money.—Mr. Lamport said he was sorry he must appeal, as it was an important case to architects.

The London Building Act 1894.

WATKIN *v.* CROW.

On the 12th February Mr. Haden Corser, at Worship Street, heard a summons taken out by Mr. Charles Watkin, surveyor and builder, of 165, Fenchurch Street, against Mr. A. Crow, district surveyor for Whitechapel and the Liberty of the Tower, under section 150 of the London Building Act 1894 (57 & 58 Vict. c. ccxiii.), complaining of the notice of objection by the district surveyor to works about to be carried out at 1, Church Street, Minories. From the notice of the case in the *Law Journal* it appears that a fire recently occurred on the premises in question, and it was argued on behalf of Mr. Watkin that he had a right to re-erect a party-wall of the same thickness as it formerly stood, as one-half of the cubical contents had not been destroyed. In this case only one-third had been destroyed by the fire, and it was contended that the district surveyor had no power to have it re-erected in accordance with the new Building Act. The onus lay on the district surveyor to show that it was a new building. This, it was argued, he could not do, as it was only a party-wall.

Mr. Berry, on behalf of the County Council, said the objection they took to the party-wall was that it could not be rebuilt except of the thickness required by the London Building Act 1894. Section 5, subsection 6, defines a new building as including a building which has been taken down for more than half its cubical extent, and section 208 provides that when a party-wall not in conformity with the Act is taken down or destroyed to the extent of one-half thereof measured in superficial feet, it must be rebuilt in conformity with the new Act.

Mr. Haden Corser said what he had to decide was whether the wall could be dealt with as if it belonged to a new building. That seemed to him to be a difficult proposition, and he would take time to consider the point. He asked that the Act bearing on the point might be left with him, as, although he was supposed to know all the Acts, this one was not supplied for the public service.